AMERICAN
DYESTUFF REPORTER

VOLUME XXIII JANUARY 15, 1934 NUMBER 2

The Importance of Iron in Textile Technology

By ARTHUR H. PETTINGER, B.Sc., A.I.C.

ONE hears occasionally the old saying that "Familiarity breeds contempt," and there is probably a great deal of truth in it that might be applied to iron.

Being a very common material in factories everywhere it is frequently ignored on account of its very abundancy and sometimes with unfortunate consequences. It is true that many alloys have been discovered and put into use of late years which offer advantages over iron as regards resistence to chemicals, but iron still holds its own and will undoubtedly continue to do so for many years to come, and be useful in a million and one ways. Thus, a knowledge of the properties of this metal will never be absolutely out-of-date and valueless, and it is for this reason that the present article is written, to refresh the memory of technical men and dyers on this important subject. We will deal with iron as it touches each department of the mill in turn.

The Dyehouse

Iron is often studiously avoided in the construction of vats on account of its solvency in acids and its unfortunate habit of rendering bright shades flat and neutral shades dirty-looking. Cast and wrought iron are both seriously corroded by boiling sulfuric acid at the concentration of the average dyebath, though it is a curious fact that cast iron will stand up well to boiling 93 per cent vitriol. It is more usual to employ wood or monel for vat construction.

In connection with the dyeing of cotton in a neutral bath of Glauber's salt with direct colors, the presence of iron is to be avoided even though acid is absent. The shades are definitely dulled by the metal and it is not improbable that iron is solubilized in a colloidal state and this helps to bring about the discoloration. It will be found, however, that the addition of sodium phosphate is of great benefit in the prevention of dulling by iron and very little is required to prevent it entirely. Part of the modification of the shade is due to the cotton itself being stained by very small particles of iron detached from the mass by rubbing and the motion of the liquor; this staining alone, not counting the mordanting action of the metal, is sufficient to make impossible certain delicate colors. Add to it then the effect of the soluble iron in combining with the color-salt and the dirty results obtained in dyeing are soon explained.

Sodium phosphate acts by precipitating completely any iron (or copper) and once rendered insoluble it is not harmful. An interesting fact was noted by the writer that phosphate also inhibited the staining by rubbing referred to above. Why it should do so is not easily understood. The following experiment may be tried: Boil in dilute Glauber's salt solution, without dye, two cotton skeins separately and to one add sodium phosphate. To imitate the effect of iron put into each vessel about 5 gm. of iron filings. When these have boiled 10 minutes take the skeins out and note the difference. The skein without phosphate is stained brown as is also the solution. With phosphate no staining is apparent. The difference is obviously due to the phosphates of soda and the observation indicates new possibilities for the salt as a rust-mark inhibitor in other processes of textile manufacture.

It would be interesting to know more about the action of the cotton fiber on neutral salts. We are accustomed to regarding textile fibers as passive elements in chemical reactions; we speak about the effect of such and such chemical on cotton.

Masters (Trans. Chem. Soc., 1922) made an observation in the opposite category, namely, that cotton substance reacts with neutral solutions of salts, rendering

them acid, presumably by the neutral salt reaction. If we may regard this as general, it would be interesting to know if this acidity is the cause of iron going into solution in contact with cotton fabrics in the experiment just described.

When we come to consider the effects of other chemicals on iron, we get results of interest to sulfur and vat dyers. According to Grundy (J.S.D.C., 39; 45; 1929), cast iron and wrought iron do not lose weight when subjected to an 8 hours' treatment in 0.2 per cent solution of sodium sulfate at 90° C. but the surface is rendered blacker in appearance due no doubt to the formation of iron sulfide. Vessels of these metals may thus be used for sulfur color dyeing without risk of interference.

Alkalies, e.g., caustic soda, are usually considered safe in vessels of iron, for kettles of this substance are used for conducting caustic fusions at a temperature of 300° C. Corrosion does take place, however, as a consequence of the gradual oxidation and removal of iron in solution as soluble ferrate. Cast iron is the least affected by the ferrous materials. Grundy records zero loss in weight but states that corrosion had taken place.

In the dyeing of azoic colors Grundy finds small but appreciable loss in weight when cast iron and wrought iron are brought into contact with a mixture of 0.2 per cent sulfuric acid and 0.1 per cent nitrite of soda in the cold. The resultant dyeings were found to be duller in shade.

The effect of hydrosulfite and alkali such as is used in vat dyeing processes was found to have but a discoloring effect on iron. No loss in weight was found nor were the Indigoid and Anthraquinone dyes affected to the extent of modifying the shade.

Basic colors were notably duller when applied in contact with cast iron and wrought iron.

The Bleaching Department

In the treatment of cotton fabrics with hydrogen peroxide and per-salts iron causes irregular liberation of oxygen with consequent risk of local over-oxidation and oxycellulose formation. Copper is similarly undesirable. Before dipping the goods, it is usual to make hydrogen peroxide faintly alkaline with ammonia which may explain why copper is sometimes dissolved (it is soluble in ammonia) but it does not account for the tendering obtained in iron vessels, for the latter metal is resistant to ammonia. The action is in this case most probably due to contact only and not to iron in solution. It is advisable to use monel or stoneware for all peroxide bleaching processes, either may be used with safety, though perhaps not without adding to the cost of the process.

In apparent contradiction to the usual precautions against bleaching where iron is present, it is interesting to note that Bolton and Dorée (Journal Soc. Dyers and Col., 1924) found that it was only when free acid was present on the fiber that tendering took place. In the absence of acid, a fabric stained with iron and bleached with peroxide was found to withstand heating several hours to 98° C. without tendering,.

Several processes have been recorded in the literature from time to time whose object is to render unnecessary the stringent avoidance of iron which is usually observed. Dalström (1926) mentions that soaps of soda tend to reduce the catalytic effect of small quantities of iron salts in the peroxide bleach. A later observation, a patent (U. S. Pat. 1,677,283) deals with a mixture of oxalic acid, borax and sodium perborate as a suitable bleach for use in an iron kier. Brit. Pat. 320,072 of 1930 described a process for making iron vessels suitable for conducting peroxide bleaching in. The inner surface is laid over with a coating of cement which is subsequently painted with silicate of soda. The claim is made that peroxide decomposition is thereby prevented.

While the following case is not strictly concerned with bleaching it is convenient to refer to it here as it is closely associated with the foregoing observations. In 1931 Holden drew attention to the risk of tendering of laundered goods exposed to dry in the open air in winter. Sulfurous acid in the atmosphere (which is always present in the proximity of industrial areas) was stated to be catalytically oxidized to sulfuric acid when iron was present in the fiber which of course causes the tendering.

In a bleach-works the well-being of the goods undergoing bleaching is the first consideration of everyone who is concerned with the process, but corrosion of the vessels used is obviously to be avoided as well, as far as possible. Cast iron and wrought iron must not be employed for holding solutions of hypochlorite or bleaching powder as they are both seriously attacked and it must not be forgotten also that monel and "Staybrite" are both appreciably affected and there is great risk of corrosion attached to using either of them for holding such chemicals. Stoneware is an old and tried material for use in handling chlorine compounds.

The Boiler House

One of the necessities of the successful operation of this important part of the factory is a good water supply and assuming it is reasonably free from scale-forming substance by pre-treatment with lime and soda, another necessary qualification is freedom from constituents which might corrode the boiler plates. Supplies derived from deep wells and mines are particularly liable to cause attack while water which is drained off land in the neighborhood of pit slag-heaps should also be regarded with suspicion, for after percolation through a pile of material rich in iron and sulfur it becomes charged with sulfate of iron. Inside of the boiler this compound decomposes with the production of sulfuric acid and the effect on the plates is disastrous.

To test a water for iron it is only necessary to oxidize a little with nitric acid and then add a solution of sulfocyanide of potash. A red color indicates iron and this test is very sensitive.

There are a number of ways of removing iron from a

water. Aeration is one of them, i.e., by cascading the water down a slope broken up by large stones (when soluble iron bicarbonate is converted to insoluble carbonate), or alternatively it may be done chemically. Manufacturers of water softening plants have special methods for treating ferruginous waters, for instance, aluminate of soda is used by some and lime treatment is sufficient in other cases. Special zeolites for iron waters are available, too. Apart from the boiler house, an iron free water is an advantage in any textile house where bleaching, scouring and dyeing is done.

Cases occasionally arise where boiler corrosion is due to grease either admitted via the water or which has arisen after constructional alterations. If that is the cause a careful clean-up, when the fire has been raked out, with paraffin or petrol will do much to relieve the trouble. If corrosion is due to acid, a block of zinc suspended in the boiler and in proper electrical contact with the plates is said to improve matters because the zinc is attacked in preference to the iron (use about 2½ oz. per square foot of heating surface). Any electrolytic action there is tends to clean the plates and keep them clean for hydrogen is evolved and de-oxidizes the rust. Incidentally, this method is said to be useful for cleaning any iron articles that have gone rusty. Acidified water is made to cover the metalwork, and zinc is attached to it and a good clean contact made. There are occasions in a mill when rusty articles of no great value are required to be cleaned and this method is then worth a trial. Degreasing previous to dipping might, however, be necessary.

Of great interest to those concerned with the factory's fuel are the experiments recently conducted in the washing of chimney gases to remove sulfur dioxide and trioxide, the two objectionable constituents which are formed as the result of the oxidation of sulfur compounds in the coal. These gases, being acid, cause untold corrosion to stonework, e.g., buildings, etc., and the removal from the atmosphere of our cities is greatly to be desired.

They are found, as a rule, in about equal proportions in the waste gases, but they differ considerably in solubility in water; sulfur trioxide is much more readily dissolved and hence removed when the gaseous mixture is sprayed. Even so, the removal of these gases has been impracticable in the past because of its cost; some 300 tons of water having been found necessary per ton of coal consumed in order to wash out the sulfur dioxide. More recently encouraging results have been obtained by the combined action of a catalytic metal as well as water. Manganese is effective as is also sulfate of iron (ferric), its function in this role being that of a catalyst to assist the oxidation of sulfur dioxide to sulfur trioxide with corresponding increase of solubility in water. Working on these lines it is found that the water required to wash out the gases is reduced to a much smaller figure, of the order of 1½ tons per ton of coal burned, an enormous saving of water. These experiments have as yet reached no final stage, nor is the treatment of chimney gases general, but we may look forward to the day not far ahead when some such simple and inexpensive process is devised that will enable every manufacturer to participate in reducing the quantity of poisonous matter discharged into the atmosphere.

Of the catalysts tried, iron sulfate stands as good a chance as any of being adopted, because it is so cheap and abundant, and we may yet live to see the day when the use of this chemical will bring about the alleviation of acid in our atmosphere with untold benefits to the appearance and beauty of the buildings of which this age is so proud. Perhaps we are justified in believing that far from being past, the Iron Age is scarcely begun.

To Continue Services

Services to coal tar products trades and consumers will be continued in 1934 according to C. C. Concannon, chief, chemical division, Bureau of Foreign and Domestic Commerce, Washington, D. C. These services consist of a monthly statement of imports of dyes and other coal tar products into the United States together with a weekly bulletin which gives news of the world affecting the domestic chemical industry.

The import statement (No. 2865) details imports of dyes and other coal tar products giving quantity and invoice value, countries of origin, bonded warehouse stocks, and other information designed to enable manufacturers and others interested in the trade to gauge competition from foreign imports, plan purchases, and follow advances in foreign technical progress. The usefulness of this unique service has been demonstrated to the synthetic organic chemical industry as well as to consumer trades, such as those relating to textiles, paper, leather, plastics, rubber and the like as well as to manufacturers of medicinals and pharmaceuticals and industries using flavoring and perfume materials.

The weekly "World Trade Notes," issued each Monday, contains an average of 40 news items gathered from all parts of the world, together with a list of foreign trade opportunities received during the preceding week.

Mr. Concannon will be pleased to forward free sample copies of any of the Division's publications.

Appointed Representative

John W. Schumacher of 235 Woodland Ave., Detroit, Mich., formerly chemist for Acme White Lead & Color Works and later connected with the United Color & Pigment Company, has been appointed sales representative for Glyco Products Co., Inc., Brooklyn, N. Y.

He will specialize in the newer synthetic resins, waxes, and emulsifying agents for the Detroit district.

The Scientific Aspect of Milling

By **A. J. HALL, B.Sc., F.I.C., F.T.I.**

(Specially Contributed)

(*Continued from page 29, January 1st issue*)

3. Elasticity

IT IS reasonable to expect that the elasticity of wool fibers will play a part in milling for in this process the wool material is necessarily subject to stretching and contractive forces. Shrinkage of the material could not occur if the fibers lacked the power to recover their original length after being temporarily stretched, and presumably this power of recovery will determine to some extent the rate and degree of milling.

In dealing later with milling conditions, it will be pointed out that the pH of the milling liquor has a large influence on the extent to which the wool material shrinks; the curve in Fig. 6 well illustrates this point. It is therefore of interest to inquire whether the elasticity of wool fibers varies with the pH of any liquor in which it may be immersed. If the elasticity changes in the same manner as does the milling properties then it is reasonable to suppose that this property of wool is definitely effective in milling.

Actually it is found that the power of wool to recover from stretching is approximately influenced to the same extent as is milling by the pH of the liquor in which the wool is immersed. Between pH of 4.0 and 8.0 wool has its minimum elasticity and also its least tendency to shrink during milling.

In a similar manner it is found that it is more easy to stretch or deform a wool fiber within the limits of pH which favor milling; this fact is strikingly shown in Fig. 4 which was obtained by Speakman and Hirst (Trans. Faraday Soc., 1933, *29,* 148).

It has previously been mentioned that milling is most satisfactorily carried out at 45° C., and it would therefore be anticipated that the extensibility and power of recovery of wool fibers would be highest at this same temperature. This is actually the case as is evident from band-curve shown in Fig. 5 which show that wool fibers after stretching show an increasing reluctance to recover their original length at temperatures exceeding about 35° C. It must be noted, however, that wool becomes increasingly extensible as the temperature is raised up to 100°C. But milling power is only proportional to extensibility so long as the stretched fibers retain their power to recover their original length, and it is found that as the temperature is raised this recovery power (true elasticity) diminishes. The optimum conditions of temperature under which a wool fiber can both be easily stretched and recover on release of the stretching force is about 40°C. and this is also about the optimum temperature of milling.

It must thus be concluded that since the elastic properties of wool fibers vary with conditions in a manner closely parallel to milling properties the elasticity of wool plays an important part in the shrinkage which milling produces.

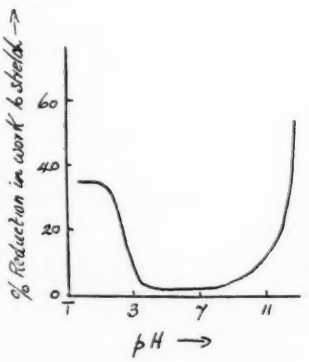

Fig. 4

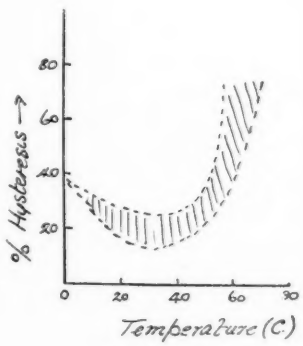

Fig. 5.

4. Swelling in Aqueous Liquors

When immersed in water, wool fibers become considerably thicker and slightly longer and it appears likely that these changes could assist the milling process. It is also interesting to note that wool fibers swell most in acid and alkaline solutions and, as previously pointed out, the optimum milling conditions of pH are without the limits of 4.0 and 10.0. Actually milling is most satisfactory when the pH of the milling liquor is about 10.0. Speakman, Stott, and Chang (J. Text. Inst., 1933, *24,* 279 T) have therefore closely ascertained how far swelling may be correlated with milling efficiency.

It is known that the presence of an inorganic salt in an aqueous liquor usually has the effect of preventing the swelling of any textile fibers which may be immersed therein. This fact is utilized in the mercerization of viscose rayon materials with caustic soda where brine is used for washing out the alkali so that excessive swelling of the rayon may be prevented. In much the same manner the swelling of wool when immersed in dilute acid liquors is restricted by the presence of common salt. A milling experiment was therefore carried out in which wool fabric samples were milled under similar conditions in dilute hydrochloric acid with and without the presence of salt. The following shrinkage results were obtained:

Milling Liquor	*pH of Milling Liquor*	*% Shrinkage After:* 1 *Hour*	5 *Hours*
Hydrochloric acid ..	1.88	3.2	13.5
Hydrochloric acid + Sodium Chloride .	1.74	5.4	22.2

If the swelling of a wool fiber increased its tendency to mill and vice-versa, it would be expected that milling in a liquor containing salt (this represses swelling) would partially prevent milling. The above results clearly indicate that the presence of salt assists milling. Obviously this experiment casts doubt on the influence of swelling in the milling process.

Swelling is of course dependent on the temperature of the liquor in which the wool is immersed. Thus it would be anticipated that the temperature of maximum swelling would be about equal to that for most satisfactory milling if swelling assisted this process. But the following results obtained with a Southdown wool indicate that swelling of wool in water is at a minimum with a temperature of 37° C.

Temperature of Water	*% Increase of Volume of Wool*
20° C.	35.72
25	34.12
30	33.07
35	32.44
40	32.48
45	32.91
50	33.60
55	34.23
60	34.81
65	35.80

In contrast, the following results obtained by milling wool fabric at various temperatures with a soap liquor show that the optimum milling temperature is about 45° C.

Duration of Milling	*% Shrinkage of Fabric at:* 37.1°C.	42.0°C.	47.6°C.	52.2°C.
½ hour	15.2	18.6	16.7	15.2
1½ hours	51.2	54.2	53.3	49.4
2½ hours	60.1	...	61.5	60.6

It must therefore be concluded that the swelling properties of wool are of but minor importance so far as the process of milling is concerned.

The influence exerted by the various properties of wool fibers in milling having been indicated above, it is now convenient to consider the conditions of the milling process itself. It has been found that the chief factors are the temperature and pH of the milling liquor. It has already been pointed out that milling proceeds most satisfactorily at about 45°C., and the curve shown in Fig. 6 indicates that milling is most rapid at about 10.0 pH. This curve was obtained by treating Cheviot fabrics with liquors containing sulfuric acid, potash soap, and sodium carbonate (according to the pH desired) and determining the pH of the liquor potentiometrically after milling for four hours; that portion of the curve between 4.0 and 8.0 pH is hypothetical since no liquors having a pH within these limits were investigated, but supplementary evidence is available to show that it is substantially accurate.

In practice, alkaline milling is carried out to a greater extent than acid milling, but milling with acids is very efficient in spite of this fact. Alkaline milling is favored on account of harmless nature of the liquors used; the use of acid liquors obviously demands that precautions be taken against attack of the metals used in the milling machinery.

Finally it is now possible to return to the theory of milling. Shorter's theory, as previously outlined, appears to explain the milling process quite satisfactorily and fully except that it takes but little notice of the elastic properties of wool fibers and their power to recover after being stretched. It is certain that in milling, wool fibers must be subject to stretching and compressing forces and thus it becomes necessary for the milling theory to correlate these with the shrinkage which ensues. Related to this theory is that of Arnold (Leipziger Monats. fur Textilind., 1929, *44*, 463, 507, 540) in which the behavior of wool fibers during felting is compared with the manner in which a worm crawls—it alternately extends and contracts in length. Speakman therefore suggests that a reasonable theory of milling can be postulated by combining the theories of Shorter and Arnold. It is therefore believed that in the milling process where wool fibers are connecting links between places of loose and tight entanglement, these fibers will become stretched while piercing or retreating into the loose entanglements. Subsequently, and as the opportunity is afforded by the movement of the fabric being milled, the stretched fibers will attempt to regain their original length and thereby draw together more closely the loose and tight entanglements with consequent shrinkage of the fabric. The degree of shrinkage is governed by the ability of the fibers to regain their original lengths, and this in turn depends on the properties of the wool and the effect on them of the conditions which exist during milling. Thus in milling, the scaliness of the wool fiber assists the formation and uniting of places of entanglement, while its elasticity and

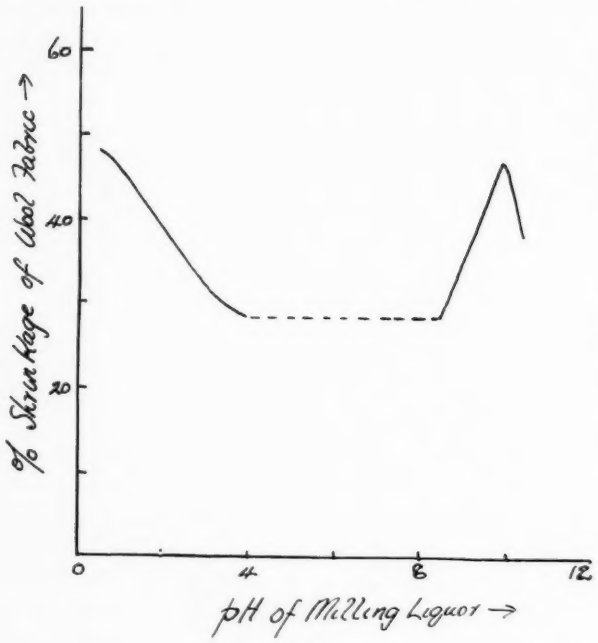

Fig. 6

extensibility promotes shrinkage. Efficiency in milling can be secured by arranging the conditions so that they favor the action of these properties.

Occupies New Headquarters

Headquarters of the American Society for Testing Materials have been moved from the Engineers' Club Building, 1315 Spruce Street, Philadelphia, to more adequate offices in the Atlantic Building, 260 S. Broad Street, in the same city. The present offices have been occupied for the past 14 years.

The new rooms comprise about 2600 sq. ft. on the fifth floor of the building to be devoted to Offices, Reception Room, Members' Lounge and Board Room and 850 sq. ft. on the fourth floor for storage of publications and use as a shipping and general work room. The increase in total floor area is some 40 per cent, while the general office space is nearly 60 per cent greater.

A large and more attractive Board Room has been planned and most important, an adequate Reception Room and Members' Lounge will be provided. Greatly improved facilities for meetings of administrative committees will be available. The new rooms are excellently suited to the present needs of the Society and for some little time in the future.

Friends of A. S. T. M. are cordially invited to inspect the new headquarters. They are convenient to railroad stations, hotels and clubs, being just a half block from the Engineers' Club.

Elected President

Paul C. Debry was elected president of the Federated Textile Industries, Inc., successor to the Silk Association of America, Inc., at the first meeting of the Board of Directors of the new organization held recently at Silk Association headquarters. G. H. Conze was elected vice-president, and Ramsay Peugnet, executive vice-president and treasurer. I. L. Blunt will act as secretary.

Applications for membership as affiliated associations were accepted from the following groups: Broad Goods Weavers Association, Fashion Fabrics Council, Ribbon Manufacturers of America, Tie Fabrics Association, Silk Thread and Floss Industry, Thrown Yarn Council, Woven Label Manufacturers Association. All former members of the Silk Association who are not connected with any of the affiliated associations will be eligible for associate membership in the Federation.

The executive committee of the new organization will comprise: Paul C. Debry, Duplan Silk Corporation; G. H. Conze, Susquehanna Silk Mills; B. Edmund David, David Silks, Inc.; Irving Levy, Century Ribbon Mills, Inc.; Ramsay Peugnet, formerly executive vice-president of the Silk Association.

Advanced Rayon Course

Columbia University, Extension Division, announces an intensive advanced evening rayon course for those that have already attended the elementary rayon course e Z 3 or who can offer suitable practical experience in the rayon field. The course will deal with advanced fabric construction details, analyses and testing of the latest rayon fabrics of all types. The methods used in finishing, dyeing, printing, creping, etc., will be fully described on the basis of samples, films, and trips to nearby plants. Costing of such fabrics from grey to converted will be done in the classroom. Special problems will be assigned each student. This course, named e Z 4, is a continuation of the elementary course given in the fall. The course is given by Herbert R. Mauersberger, Textile Consultant, of 303 Fifth Avenue, New York, and consists of 15 lectures, beginning on Thursday, February 8th, at 7:30 P. M., in Room 410 B, School of Mines, 116th Street and Broadway, New York. Registration for this and other textile courses begins on February 1st, 1934. For more information phone MUrray Hill 4-1108.

Seventieth Birthday

On the occasion of his 70th birthday, Dr. Arthur Dehon Little, on December 15th, was presented by his staff with a specially bound and inscribed volume of the Morse Collection of Japanese Potteries. Actual presentation was made by Roger C. Griffin, director of tests, and a member of the Board of Directors of Arthur D. Little, Inc. Mr. Griffin is a son of Roger B. Griffin, Dr. Little's original partner when the organization was formed as Griffin & Little in 1886.

PROCEEDINGS OF THE
American Association of Textile Chemists and Colorists

JANUARY 15, 1934

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Report of Research Committee*

By **LOUIS A. OLNEY**, *Chairman*

BEFORE proceeding with the report of the Research Committee, I will say that I am very sorry that Mr. Gerli did not remain long enough for me to express to him the very deep appreciation of our Association, and more particularly of the Research Committee, for his prospective offer of the support of one or more research fellowships. This came in such a spontaneous way, without the preliminary laborious work that has usually accompanied our efforts to secure support—and then most frequently without any result—that it is, to say the least, refreshing, and highly appreciated. I believe that this may be the beginning of a new era in the work of our Research Committee.

There has been an undertone of feeling, I believe, for some time that our research work was being done very largely by the members of our Association and was not receiving sufficient support from industry. That may be true to a certain extent but I think there is a phase of the situation that after all we do not wholly appreciate.

The funds that have been available during the past year, for instance, for our Research Committee, have been approximately $11,000. Of that amount, $2,500 has come through the Association and a goodly part of that through our corporation members, and $8,500 from an allocation of the Textile Foundation. All of Textile Foundation's money originally came from the textile industry. So you will see that after all industry is doing a great deal to support our research and this kind offer of Mr. Gerli I think is another indication that at last industry is appreciating what we are doing for them. I am certain that industry will come to our rescue, as you might say, at this time, when the Treasurer reports an increasing deficit each year, and I am hoping that we may see a great development of our research work during the next few years.

At the Chicago meeting I presented a general report of the Research Committee which was published in the

* Presented at Annual Meeting, December 8.

October 8th edition of the Proceedings, so I will not at this time review the work done during the previous part of the year. On the other hand, if I should proceed with any detailed report at this time I would be simply anticipating what the various Sub-Committees are about to report. In the 1933 Year Book there will be published a full report of the Research Committee.

Our work has grown so that we have twenty-two sub-committees at the present time working under the direction of the general Research Committee, and while I am not going to call upon all of these committees to make reports at the present time, there are a number that will make very brief reports that will give some idea as to what is being done.

I am going to call upon the chairmen of these particular committees to report whatever they may have to say in a very brief way and in the Year Book there reports will all be published in full.

The first sub-committee is that on Fastness Tests for Dyed Silk, of which Dr. Walter M. Scott is Chairman.

Fastness Tests for Dyed Silk

W. M. Scott, *Chairman*

The report of the Committee on Fastness Tests for Dyed Silk will be very brief at the present time. Our activities have largely been completed in that we have developed and put on record standard methods for testing the fastness of dyed silk and have gone so far as to prepare definite dye standards representing classes of fastness to washing. These standards are available and may be obtained from the Secretary of the Association.

During the past year, as evidenced by the last Year Book, we have slightly modified the washing procedure to clarify it to some extent, in that we have definitely made a separation between testing the fastness of dyestuffs on silk and testing the fastness of the dyed silk fiber. In one case you have a subject in which the dyestuff manufacturers and the textile dyers are primarily interested and in the other case, the fastness of dyed silk, the consumer has the chief interest.

So we have kept our tests for fastness of dyestuffs on silk as they were and have added to that a standard test for testing the fastness of dyed silk, to determine whether it is washable by the procedure which is recommended for the washing of silks. That method has been published in the latest Year Book, the 1932 Year Book, and is now available to members of the Association.

Thank you. (Applause.)

Professor Olney: Sub-Committee on Fastness Tests for Dyed Wool, Mr. Hugh Christison.

Fastness Tests for Dyed Wool

Hugh Christison, *Chairman*

The most important work being done on wool at the present time is in charge of another chairman (referring to work of Committee on Carbonization) and I think you will hear from him quite soon.

The work of the committee with which I am associated has been along the lines of testing for fastness to fulling. We think that we have given the industry a test for fulling that they have long wanted and that is quite satisfactory. The methods and standards are available and we consider that work as finished.

The next work we undertook was similar to that, that is, the development of standards of fastness of dyed wool to washing. Those standards, four of them, ranging from nearly perfect to one which is quite poor, have been developed. The material has been dyed in a commercial way and as soon as the Committee approves of those dyeings they will be available to the trade and we certainly hope they will be acceptable. (Applause.)

Professor Olney: Sub-Committee on Fastness Tests for Dyed Cotton, Mr. Geo. A. Moran.

Fastness Tests for Dyed Cotton

G. A. Moran, *Chairman*

There has been very little change made in the methods of procedure on the cotton fastness tests during the past year. There has been a slight modification of the wording of the tests as published in the last Year Book. There has been an addition of certain terms or phrases which could relate the classifications as previously given so that they can be better utilized in the retail merchandising of cotton textile fabrics.

The alternate methods as given do not exactly agree with the standard methods as they have been adopted and it will be necessary to revise these alternate methods slightly so as to overcome these discrepancies. This will be done before the publication of the next Year Book.

At present there are three classifications under the standard methods, while under the alternate methods there are four classifications. The four classifications will be reduced in the revised form so as to have three, as in the case of the standard methods.

During the past year the dyed standards for cotton have been prepared and passed upon and are now in a condition to be offered shortly in the same form as the silk standards have already been adopted.

Four standards were dyed, but these are to be reduced to three. There is a standard for the two faster classes as originally adopted. The Number 3 classification, Methylene Blue, is to be dropped out and the Number 4 classification will be used as the Number 3, which will complete the necessary standards. These will be available shortly. (Applause.)

Professor Olney: I am going to call upon the next committee a little out of order on the list because the Chairman is anxious to get away. That is the Sub-Committee on the Carbonization of Wool.

About a year ago we instituted something of a new principle in connection with some of our sub-committees, namely, what might be called an advisory committee.

Where certain research associates were working on specific problems, we selected a committee from industry and from the profession that would best be able to supervise and advise in such work. Mr. Roland E. Derby is Chairman of our Advisory Committee on the Carbonization of Wool. We will hear from him at this time.

Carbonization of Wool

R. E. DERBY, *Chariman*

The Committee on Carbonizing is not ready to make a detailed report of its work at present. However, I will say in the way of a report of progress that we have attacked this proposition from two different angles: One, with the assistance of Dr. Harris at the Bureau of Standards, from a purely technical angle; the other, with the assistance of our Research Associate, Mr. Ryberg at Lowell Textile Institute, from as nearly a practical angle as we could.

Mr. Ryberg has had the assistance of the Committee directly in carrying on his work while Dr. Harris has had the advice and consultation of Mr. Appel. We hope in the near future to get the reports of these two associates together into a joint report, with possibly reference to practical work, which will be of interest to the practical mill man, so that we can give the mill man some means of solving a great many of the present-day problems in carbonizing.

One particular problem, for instance, is the one of resist spots. I think when we are through with this report every mill man will be able to go into his mill and if he is having any trouble with resist spots will be able to eliminate it.

All the work is practically complete and I think within the next month or two we will be able to have this report for the DYESTUFF REPORTER. (Applause.)

Professor Olney: The next Sub-Committee is that on Light Fastness, of which Wm. H. Cady is Chairman.

Light Fastness

W. H. CADY, *Chairman*

I have prepared a detailed account of the present program but it is too long to read at this late hour. It will, however, be published in the DYESTUFF REPORTER.

It states the work that the Committee has been doing along three different lines:

One—developing standards of fastness;

Two—testing the relative merits of different light fading lamps to determine which is most like the sun; and

Third (and the most recent work)—testing the relative effect of different intensities of light in fading dyes when humidity and temperature are constant.

As I said, full details will be given in the DYESTUFF REPORTER, in this report. (Applause.) (*Report follows*)

The Present Program of the Light Committee

1. *Developing Standards of Fastness.* Fifteen or twenty years ago the Echtheitskommission of Germany published selected lists of dyes, eight for cotton, eight for wool, etc., possessing different degrees of fastness to light, ranging from very fugitive to very fast, and recommended that these be adopted as standards of fastness for all the dyes in their respective classes. Subsequently, it was found advisable to withdraw all the dyes except those on wool, which were recommended to be used as standards for all colors, regardless of fiber. The original list of wool dyes was thoroughly tested out by our committee several years ago by means of sun and Fade-Ometer tests, using dyed samples made under German auspices as well as our own dyeings. It was found that while five of the eight dyes possessed considerable merit as standards, in that the fading was clean-cut and showed a wide range of fastness from poor to good, the spacing was not altogether satisfactory, and the remaining three dyes by the nature of their fading were distinctly unsatisfactory. Our committee rearranged the five good standards, and added one more of our own choosing, and in the 1931 Year Book we proposed these six dyes as tentative standards, and asked for criticisms (the only ones received to date were from Dr. Barker, of the British Wool Industries Research Association, who exposed a set of our tentative standards at Torridon, Leeds, and sent us his comments).

In 1932, however, the German Kommission published an entirely new list of eight wool dyes which they recommended in place of their former selections. This necessitated additional tests by us, to determine whether the new list was an improvement on our own, and we have been conducting these tests for over a year, on dyed samples made by the Germans as well as our own dyeings. In the meantime we have been trying out quite a number of other dyes, in an effort to produce one or two "top standards" by the use of dyes which may be applied to wool in a simple manner (preferably acid dyes) instead of using such dyes as the Indigosols (used by the Germans for the highest degrees of light fastness) which are not convenient to apply and require great care if the same exact shade is to be reproduced each time. All of these trials are still in progress, as it takes nearly two years of sun exposure to complete the testing of one of these very fast dyes. By next summer this work should be completed. We usually make three separate exposures: 1, in the Fade-Ometer; 2, in the sun, under glass, exposed only when the sun is shining, between April and October and between 9 a. m. and 3 p. m.; 3, like No. 2, but continuously day and night and in all weathers. We believe that if we can find seven or eight dyes which in all three tests show a regular gradation of fastness from fugitive to permanent, and all of which fade in a clean-cut manner, showing sharp contrasts between any two periods of exposure, we can properly offer these to the public as standards.

In this connection it is interesting to note that the British Wool Industries Research Association has also de-

veloped a set of standards of light fastness, which has now been officially adopted by that organization. We have requested dyed samples of these, and plan to make comparisons with the German standards and with our own tentative standards.

2. *A Study of Fading Lamps.* For several years we have been conducting a series of comparative tests in the Fade-Ometer, an American fading lamp, and the Fugitometer, made in England but quite similar in its fundamentals, in order to determine their relative merits as substitutes for the sun, which of course is still the standard fading unit. This work has been prolonged by the fact that both instruments, particularly the Fugitometer, have been modified from time to time by their makers, which has necessitated much repetition on our part. The dyes used in these exposures (Series 8) are forty in number, specially selected for the purpose, and about equally divided between cotton, wool and silk. The most recent tests include exposures made by Dr. Larose of the National Research Council, Ottawa, Canada, in a standard Fugitometer of the latest type; exposures made by Dr. Hall of the Ontario Research Foundation in an improved Fugitometer designed by himself; exposures made in the new Fade-Ometer, type FDA, and standard sun tests, both made at the Bureau of Standards. In all of these lamp tests particular attention has been paid to the temperature and relative humidity of the air surrounding the exposed samples. This work is now practically completed, and a report should be forthcoming in the near future.

Meanwhile the British Cotton Industry Research Association are experimenting with a 150 amp. high intensity arc for fading purposes, and we have sent them at their request a complete set of Series 4 dyed samples, unexposed (1,127 in number), which they will expose in their lamp and will return to us later for comparison with the similar exposure we have already made in the sun and Fade-Ometer.

3. *The Effect of Different Intensities of Light on the Relative Fastness of Dyes.* We have constructed a fading cabinet at the Bureau of Standards in which samples may be exposed to an arc light under controlled conditions of temperature and humidity, but with different intensities of light (using identical light sources, but varying the distance from the samples). This is now in operation, and will give us much useful information on a subject which has not had enough attention in the past. It is the popular impression that the proper way to make quick light tests is to use a light of very high intensity; but it has already been shown by others that fading produced under these abnormal conditions is quite different from fading produced normally, some dyes appearing faster than they really are, and others more fugitive. Light of unusually low intensity is likely to produce abnormal results also. We plan to make a thorough study of these phenomena during the fall and winter.

Professor Olney: Mr. Cady is also Chairman of one of our advisory committees, the Sub-Committee on Textile Printing Pastes, and we will hear from him again on this subject.

Mr. Cady: Do you want me to read this report?

Professor Olney: I think so. This is a new project and an important one. I think we should hear the report.

Textile Printing Pastes

W. H. Cady, *Chairman*

The title of this research project is "A Fundamental Study of Vat Printing Pastes." Its purpose, broadly speaking, is the acquisition of knowledge which will enable the color-mixer to produce better and cheaper colors. However, the Committee has no thought of concentrating on the purely economic aspect, important as it is, but has planned a varied program of research in which the following subjects are perhaps among the most important:

1. A study of all the substances which enter into our present-day vat printing pastes, to determine their respective merits and defects, and the effect of each on all the others; this will include the various alkalies, reducing agents, hygroscopic and dispersing agents, thickenings, lubricants, etc., and of course the dyes themselves.

2. An examination of representative vat printing pastes taken from actual use in the mills, with the object of accurately measuring their physical characteristics, and if possible determining what particular factors are chiefly responsible for the quality of the printing paste and give it the "consistency" which is necessary for good working.

3. A study of the methods used in preparing the various thickening materials used in vat printing.

Obviously such a program requires much time and a large amount of experimentation. Dr. Sivert N. Glarum, a recent graduate student at Brown University, has been engaged by the Committee as a Research Associate to conduct the investigations. After visiting a number of textile printing plants and studying the technique of the color-shop at close range, and discussing his problem with dye and thickening manufacturers, colorists, printers, mill chemists, and others, he started work in one of the Brown laboratories, through the courtesy of Dr. Kraus, the head of the department. He first installed a capillary tube viscometer, and using samples of printing color taken from practical runs in some of the local print works, he carefully measured their flowing properties at various pressures, and by calculations from these data he was able to determine the "yield value" of each color, which is supposed to have considerable influence on its "consistency." He also made a number of surface tension measurements, but concluded that this is not a factor of great importance in print colors.

The capillary viscometer is not a very convenient instrument for making large numbers of readings, as it is too slow, and it is not suitable for measuring rates of flow at low pressures. Dr. Glarum therefore borrowed a

Stormer viscometer from Lowell Textile Institute, and has since found that the results obtained from this instrument, which seems to be preferred by many investigators in this field, are quite accurate enough for all practical purposes, while the operation of this instrument is much more rapid.

While there is still much work to be done before we can hope to define the "consistency" of a particular print color in mathematical terms, we believe that the work of the last six months in making these physical measurements will prove of much assistance in carrying out the subsequent investigations, by providing a solid foundation on which to build.

The work under way at the present time has to do with the preparation of the various thickeners which are used in vat printing, including the starches, the British gums, Tragacanth and the other natural gums. It is planned to study each of these very carefully, so as to establish the optimum conditions under which it should be cooked, stirred, cooled, etc. Such a study of thickeners has probably not heretofore been made, at least for publication, and it should be of considerable value to the industry. This will be followed by an investigation of the effect on these various thickeners of everyone of the other substances which are added to the print color. We have plans for still further developments, but what has already been said will perhaps suffice to indicate the general scope of the project.

Professor Olney: One of our important committees is the Sub-Committee on Research Program of which Dr. Donald H. Powers is Chairman.

Research Program

D. H. Powers, *Chairman*

The Committee on Research Program has the problem of lining up research programs for the Research Associates and lining up advisory committees to work with the Research Associates.

You have just heard the reports of the two advisory committees who are acting in an advisory capacity for our four Research Associates.

At the present time we have the problem of selecting problems for the coming year for our Research Associates. We hope to continue some of the problems we are working on and we expect to start on new problems. At the present time we have a list of eighty problems suggested by the members of the Association relating to cotton, rayon, silk, and wool. We would appreciate it very much if any of you have any suggestions as to the type of problems you believe the Association can most advantageously work on if you will submit them to the Committee as ours is a difficult problem, that of selecting problems which will be of the utmost value to the largest number of members.

We expect to go over this list and select those problems which will be best suited to our Research Associates. As you know, we are particularly fortunate at the present time in having the space contributed for that work by the Bureau of Standards, Brown University and Lowell Textile Institute.

Thank you. (Applause.)

Bibliography

Professor Olney: The Chairman of the Sub-Committee on Bibliography of Textile Chemistry, Bleaching, Dyeing and Finishing is not present but for him I will report that the bibliography will be continued, revised, and extended in the 1933 Year Book. This bibliography, I believe, is valuable to all who are scientifically and technically interested in the textile industry.

Next is the Sub-Committee on Waterproofness of Fabrics, of which Dr. J. F. X. Harold is Chairman.

Waterproofness of Fabrics

J. F. X. Harold, *Chairman*

There will be very little substantial change in the Year Book on this subject, except perhaps some change in the cut describing the box test used by the Bureau of Standards, and perhaps some recommendations that those who use that box test advance this research until there is an expression not only of the manner of testing, but what is meant by "waterproofness," "rainproofness," and "showerproofness," so that it will more or less coincide with the hydrostatic pressure test described under the same article.

It is believed by your Committee that there is very little value in a test unless it sooner or later leads to a definite expression of what are the norms for the application of that test. (Applause.)

Prof. Olney: Sub-Committee on Color Standardization. Dr. Scott.

Color Standardization

W. M. Scott, *Chairman*

The Colorimeter Committee also has in connection with the Year Book established a practice of publishing a bibliography on articles dealing with color in textiles. That is being continued over the present year and will appear again in the next Year Book.

Outside of that the chief activity of your Colorimeter Committee has been to represent this Association in the organization known as the Inter-Society Color Council which is a national society composed of those national associations which are primarily interested in color. In other words, it is a group of associations that have as their primary interest color, both from the angle of measurements and specifications.

In connection with the activities of the Inter-Society Color Council we have had the privilege of associating with other associations which deal with color in its various phases. That is, for instance, the scientific end of color has been handled very well by the American Optical Society, and similar societies to that. Then there are repre-

sentations from color in art by the membership of such organizations as the National Academy of Design, and there is close cooperation with the Eastern Arts Association and the Western Arts Association. Then there has also been associated or represented color in industry, by our own Association and by the Technical Association of the Pulp and Paper Industry.

I think possibly I might just read the report of one of the committees of the Inter-Society Color Council which has been quite active recently, to give you some idea of the work which the Council is endeavoring to promote. They have a Committee on Color Names and Nomenclature and I shall just take time to read a small paragraph from the report of that Committee.

"The report of this Committee indicates that it is possible to name any color on a scientific basis and with the use of twelve ordinary English words, the adverb 'very' and the suffix 'ish.' These words are: red, orange, yellow, green, blue, purple, light, medium, dark, weak, moderate strong. Each of these words has a very definite, positive meaning. Whether the color specifications be by spectrophotometry, by monochromatic analysis, by trichromatic analysis, by comparison with color charts, by use of the Lovibond glasses, or by any other standard method, the naming in English words can be scientifically accomplished. Unfortunately, while the number of words in this color vocabulary is so extremely few, yet the color name is sometimes quite long. A solution of Potassium Permanganate, 1 in 100, viewed in a thickness of 25 mm. would be described as 'very dark purple,' but if viewed in a thickness of 10 mm. its scientific name would be 'dark very strong reddish purple.' The colors of three samples of powdered aloe were determined by trichromatic analysis and under the recently adopted international requirements, and then were named as follows: Strong Orange Yellow, Dark Strong Yellowish Orange, and Dark Weak Orange."

What this particular Committee is trying to do is promote some standardized method for description of color which will mean something.

The Committee work has been sponsored considerably by the officers and directors of the United States Pharmacopeia who are anxious to get a definite method of describing color in the Pharmacopeia which different readers of the Pharmacopeia will interpret in the same way.

I think that will give you some idea of the work which the Inter-Society Color Council is trying to do in coordinating the activities in the realm of color.

I might add that this Inter-Society Color Council is holding its third annual meeting at the Columbia University College of Pharmacy in New York City on Thursday, December 28th, and any members of this Association who might be interested to attend are very welcome to and if they wish any further information about it I would be very glad to answer their questions at any time.

Thank you. (Applause.)

Standard Methods of Determining Sizing, Weighting and Finishing Materials

Professor Olney: Mr. Russell Hook, the Chairman of the Sub-Committee on Standard Methods of Determining Sizing, Weighting and Finishing Materials in Textiles is not present but from a letter recently received from him I shall read the following paragraph:

"Certain members of the Committee have been giving considerable thought relative to methods, and their possible value to industry, for the direct determination of starch in textile materials, but this work has not advanced to a sufficient stage where we have anything to publish. All we can do is to report that some progress is being made."

The next committee is the Sub-Committee on Shrinkage of Textiles. This committee has been doing some very important work during the past year. Mr. Howard D. Clayton, the Chairman, had to leave early but Mr. P. J. Ariente, another active member of that committee will report for Mr. Clayton.

. . . Mr. Ariente presented the prepared report of the Sub-Committee on Shrinkage . . .

Shrinkage of Textiles

H. D. Clayton, *Chairman*

The work of the shrinkage committee during the past year has been confined to cooperative effort with the New York Board of Trade in an endeavor to obtain the adoption of the Association's shrinkage method as a standard method to be used by all testing laboratories.

The New York Board of Trade has asked the American Standards Association to recommend the Association's method as a standard, and one conference has been called by the American Standards Association with this idea in view.

Our standard method has already been adopted by Committee D-13 of the American Society for Testing Materials and has been rewritten and published by them on page 125 of their phamplet No. 30D274. It has been published, with some changes in wording, by the Bureau of Standards as method CCC-T-191 of the Federal Standard Stock Catalog, section 4, page 5, of the Federal Specifications for Textiles Test Methods. The shrinkage committee of the National Association of Finishers of Cotton Fabrics has also approved this method and is recommending its use by members of their association.

The method referred to was published in the last Year Book.

Professor Olney: Another very active committee is the Sub-Committee on Rayon of which Mr. B. L. Hathorne is Chairman.

Rayon

B. L. Hathorne, *Chairman*

We have nothing to report at this time except continued progress upon three problems published about two years ago. A method of identifying rayon, due to the progress

in the industry, must be changed. We hope to publish it in about two months.

We have continued the work upon the method of determining the fastness of dyestuffs on dyed acetate and we hope very soon to publish a list of shortcut tests that we hope will be of some value in determining the cause of some faults in some of these newer rayon fabrics.

In addition to that we hope to have prepared for delivery next year at the Annual Meeting a symposium on rayon, covering rayon thoroughly, from the raw material to the finished fabric, special emphasis being placed upon faults that show up during dyeing, and trying to place definitely the blame for those faults. (Applause.)

Professor Olney: One of our recently formed subcommittees and one which we anticipate will be one of the most important in the future is that on Standard Methods of Chemical Analysis and Testing as applied to the textile industry. Dr. Harold is Chairman of that committee.

Standard Methods of Chemical Analysis and Testing

J. F. X. Harold, *Chairman*

The Committee, owing to the extensiveness of its field, has been a little slow in getting under way perhaps because, as I say, momentum is more or less limited by weight. I am not speaking personally.

Another thing which has retarded somewhat the work of the committee is the speed with which the synthesis is getting ahead of the analysis. I refer especially to those forms of flexible reinforced concrete known as weighted silk. (Laughter.)

In many of these cases the materials that enter into these bodies are much beyond the ken of the ordinary analyst.

Then, a number of comparatively new fields to the analyst have had to be explored and the committee has been weighed down with the responsibility of selecting the exact men to do the work. We are hoping in general to cover the entire field of the analysis of textile auxiliaries, those materials that are used in making textiles, in advancing them, in processing them. We are also concerned with the perfection of those processes, perfection and control of those processes, in the advancement of the textile fiber or fabric, and we are finally concerned with the analysis of the issuing fabric.

We have had a number of very courteous acceptances from the leaders in our organization who are best adapted by their chosen field to help us. For example, the field of microanalysis, the field of the control of textile auxiliaries, and in a measure the field of the control of processes, and the field of the analysis of fabrics have been very well covered and there have been answers from leaders who said they will take care of these fields. But there are a number of fields that are yet uncovered by reason, as I say, of the actual fabric getting ahead of the analysis, and these gaps in the personnel of the Committee we are hoping to fill in the near future. (Applause.)

Professor Olney: Another committee which has published during the past year several valuable reports on their work is the Committee on Methods of Analysis and Standardization of Sulfonated Oils. Mr. Ralph Hart is the Chairman of that Committee.

Methods of Analysis and Standardization of Sulfonated Oils

Ralph Hart, *Chairman*

The Sub-Committee on sulfonated oils has already published two reports. The first one on the determination of water in sulfonated oils and the second one on the determination of combined sulfuric anhydride. The latter report was published in the American Dyestuff Reporter in the November 20th issue. (In that report the committee recommended two different methods for determination of combined SO_3. The acid-titration method for the ordinary sulfonated oils and the ash-gravimetric method for all other oils, including those containing sodium acetate and true sulfonic acid oils.)

We are now working on methods for determining inorganic salts. Sulfonated oils, as you know, may be contaminated with sodium sulfate, sodium chloride, sodium acetate, carbonate and other soluble and insoluble salts.

In the conventional procedure only the sodium sulfate is determined. This information is essential in order to calculate the combined sulfuric anhydride. In the methods for combined SO_3 recommended by the committee this information is not necessary. We therefore deemed it advisable to concentrate on a method which would determine the total inorganic salts in one procedure.

A feasible method apparently is by means of solvents in which the oil is soluble and the salts are not. The use of alcohol or a mixture of ether has been suggested in the literature a number of times, but no one has seemed to develop the method successfully. The difficulty seems to be in the selection of a medium which is a good solvent for oil and soap and at the same time will not dissolve the inorganic salts.

The committee seems to have overcome the difficulty by the use of oleic acid which acts as a solubilizing agent. Our method consists in mixing the sample with oleic acid and dehydrating in an oil bath. The oleic acid keeps the sample liquid even when completely dehydrated. In the absence of oleic acid, a hard encrusted mass is obtained which is very difficult to get into solution in solvents. The solvent we found best so far for the ordinary sulfonated oils is carbon tetrachloride. The inorganic salts are finally filtered and weighed.

A sample containing about 7% of sodium sulfate was analyzed in this manner and compared with the gravimetric method for ionic sulfates. The new method gave somewhat higher results as would be expected but they were much more concordant, i.e., the greatest difference

by the gravimetric method was 1.13%, whereas by the dehydration-solvent method it was only 0.24%. This result was very satisfactory considering the fact that the method was entirely new and no one had any previous experience with it.

Mercerization

Professor Olney: Our most recent committee—in fact, it is so recent that its organization has not been completed as yet—is a Sub-Committee on Mercerization. It has been suggested that the scope of this committee be extended to cover the preliminary processes of cleansing cotton previous to dyeing. This committee was authorized at the Chicago meeting and it was thought best to have its personnel entirely from the South. An effort is being made to secure a satisfactory committee of the best workers in the South. Professor Charles B. Ordway of the Alabama Polytechnic Institute has been selected as the temporary chairman of this committee and has been requested to proceed with its organization. Already seven members have accepted membership and several others have been invited to become members.

It seems rather a long list of reports that we have presented this evening but there are five more committees upon which we are not going to call for reports because they have nothing special to report at this time.

There is one matter which is foreign to the Research Committee but, it may interest you if I make mention of it in closing. Those who were at Chicago will remember with pleasure meeting Gordon D. Pratt, who was the official representative of the Society of Dyers and Colourists at the meeting. You will also remember, if you were there, that at the banquet each member was presented with a souvenir copper beer mug. I was going to call it "stein" but I think the other name is more accurate. I will read the last paragraph from a letter I recently received from Mr. Pratt:

"You will be interested to hear that the beer mug from Chicago arrived in England safely, although somewhat battered. However, I am informed by the Secretary of the Society of Dyers and Colourists that after straightening it, it was to be preserved along with the silver plate of the Society and will therefore occupy an honored position on the top table in each annual banquet."

That is all we have to report tonight.

Thank you. (Applause.)

Reports of Other Committees

President Rose: You have heard this report made by the Chairman of the Research Committee and I think you will all agree that it makes apparent the very large amount of work being done and the very excellent quality of that work. No work is perfect but any work pursued as earnestly and as systematically as this by those who know as much about it as the members of these subcommittees do is bound to result in the acquisition of useful knowledge, and again I should like to impress upon the membership that the great bulk of the work is of very direct benefit to the members of the Association individually. It may take time for it to get to the individual member but it is he who will benefit by this research program.

We have to hear from the Committee on Prizes of which Dr. Draves is Chairman.

Prizes

C. Z. Draves, *Chairman*

Your committee on prize papers is ready to report the prize winners for papers published in our Proceedings from November 1, 1931, to September 1, 1933.

The task of the present committee has been more difficult than usual because we had to examine papers for practically a two-year period (prizes were not awarded last year through a lack of funds) and because the number of really good papers requiring serious consideration is steadily increasing. This tendency of an increase in average quality is proof that the purposes of our Association are bearing fruit. It may be interesting for you to know that in our work we had to read and to consider critically well over one hundred written articles.

For the guidance of future committees, we give here the bases of selection for prize papers as follows:

Excellence of Material.
Originality.
Instructional Value.
Rhetoric.
Discussion Elicited.
Timeliness.
Delivery.

In the consideration of these bases it should be pointed out, however, that originality of material is not a prerequisite and that the paper need not be a report of experimental work. Any person (except research associates of our Association), whether a member or not, is eligible for a prize, the only requirement being that the paper shall have been presented to the Association free of charge for publication in its Proceedings.

Since so many excellent papers have been denied prizes, although they are practically as good as the winners and may even have been selected by other judges, your committee feels that it is only fair to publish a list for honorable mention and in that way to accord some measure of recognition to those other persons who have contributed so well to the success of sectional and national meetings.

Prize Winners

First prize of $50 to J. B. Wilkie, U. S. Bureau of Standards. "Mercerization of Cotton for Strength." Am. Dyestuff Reporter, 22, 217 (1933).

Second prize of $25 to R. E. Rose, E. I. du Pont de Nemours & Co. "Mechanism of Dyeing." Am. Dyestuff Reporter, 21, 52 (1932).

Third prize of $15 to Dorothy Nickerson, Bureau of Agricultural Economics, U. S. Department of Agri-

culture. "Cotton Fiber Quality." Am. Dyestuff Reporter, 21, 4 (1932).

Fourth prize of $10 to John B. Dick, U. S. Finishing Co. "Chromium Plating in Calico Printing." Am. Dyestuff Reporter, 22, 305 (1933).

Honorable Mention

Enzymes. D. H. Powers—Am. Dyestuff Reporter, 21, 332 (1932). Rohm & Haas Co.

Some Fleeting Glimpses of Certain Properties of Sericin. H. H. Mosher—Am. Dyestuff Reporter, 21, 341 (1932). U. S. Testing Co.

A Method for Simultaneously Making a Large Number of Perspiration Tests. John N. Dalton—Am. Dyestuff Reporter, 21, 450 (1932). Pacific Mills.

The Latest Researches on Cotton Bleaching. Hugo Kauffman—Am. Dyestuff Reporter, 21, 647 (1932).

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Impregnation of Textiles with Latex. W. J. R. Hauser—Am. Dyestuff Reporter, 22, 119 (1933). Revertex Corp. of America.

Getting the Most from Soap. W. W. Bray—Am. Dyestuff Reporter, 22, 175 (1933). Procter & Gamble.

President Rose: One of the most valuable contributions that the members of the Association receive in return for the dues they pay is the Year Book. I do not know whether this is the time to get much information about next year's book, but I should like Professor Olney to say something about that activity of the Association.

Report of Year Book Committee

L. A. Olney, *Chairman*

I know that you will all be pleased to learn that the 1932 Year Book netted approximately $75 to the Association in receipts, above costs, and furthermore that during the year approximately $150 was received through the sales of Year Books. So you will see that the Association members not only have the use of and reference to this valuable book but at the same time have profited something like $225. I believe that we should also call attention to the fact that the success of the Year Book has been due very largely, as far as the advertising is concerned, to the efforts of Mr. A. P. Howes of the Howes Publishing Company. (Applause.)

The preparation of the 1933 Year Book is well under way and we hope that the support of all previous advertisers will be continued and that many new ones may join in this means of extending this important activity of the Association.

There will be several new features in the coming Year Book. For some time there has been a call for the publication of an additional list of imported dyes, of which no corresponding types are manufactured in the United States. An endeavor is being made to include such a list in the coming Year Book, and letters have already been forwarded to the prominent dyestuff importers asking for their cooperation. In case any such dyestuff importers have been omitted, the chairman would like to have them advise him of such an omission.

In a like manner there has been for several years a call for a list of special chemical products for textile processing, and it was decided to publish such a list. A special Sub-Committee of the Year Book Committee with Dr. Carl Z. Draves as Chairman, has been appointed for the purpose of preparing such a list of textile chemical specialties. A special report of this committee will follow.

The Chairmen of Local Sections are specially requested to cooperate with the Year Book Committee, through the Secretary of the Association, by promptly sending the Annual Reports of their Local Sections, and also cooperating in bringing the Membership List up to date.

President Rose: There is one other committee Dr. Draves reminds me has to report and I will call upon him to define his own committee.

Dr. Draves: I don't want to hold you here any longer than necessary but this is a new work that I wish all the members of the Association to be familiar with and I ask your cooperation. It is a report of the Committee for Preparation of a List of Textile Chemical Specialties for the Year Book.

Report of Committee for Preparation of a List of Textile Chemical Specialties for the Year Book

C. Z. Draves, *Chairman*

The committee which has been appointed to prepare a list of textile chemical specialties for publication in the Year Book has prepared the form letter which is given below. This form letter has been mailed to a very large number of chemical manufacturers and many replies have already been received. The actual preparation of the list of chemical specialties for the textile trade will be begun very soon and it is expected that a list of some importance will be ready for the 1933 Year Book.

Since it is very probable that in spite of considerable search among the advertising pages of the journals many manufacturers of textile chemicals have been overlooked, the Committee wishes to take this opportunity to invite any manufacturer who has not received our letter to read it here and to submit his list of eligible products. The Committee also wishes to thank publicly those who are responding so promptly to our request for information.

Letter to Manufacturers of Chemical Specialties for the Textile Trade

273 Converse St.,
Longmeadow, Mass.
October 27, 1933.

Gentlemen:

For the past several years the American Association of Textile Chemists and Colorists has published in its Year Book a list of American-made dyes which has proved of great value and assistance to its many members in dye houses and textile laboratories. This list has not only received the approval of these members because of its helpfulness in their work but it has elicited favorable comment from both textile and dyestuff manufacturers. And now, because the number of new and useful special chemical products for textile processing has grown so large, a persistent demand has arisen for the preparation of a list of such chemical products which may prove as useful and as instructive to the textile chemist as has the list of dyes.

Recognizing this demand, the Council of the American Association of Textile Chemists and Colorists has created a committee for publication in the next Year Book. It is proper that we do this because only an organization such as ours can satisfactorily collect the necessary information in a fair and unprejudiced manner. In order to guide its committee in this difficult problem of deciding how much information about each chemical specialty must be submitted before the acceptance of a product for the list, the Council, after careful deliberation, adopted the following resolution:

"The list of products for textile processing shall be limited to homogeneous substances or mixtures for which the chemical formula or complete qualitative composition or method of manufacture is given by the seller."

Although the task of selecting chemical specialties for the list is difficult, as you can readily appreciate, it will be our sincere endeavor to make the selection conform to the spirit of this resolution. It is evident, therefore, that the committee, if it does err, will lean toward the position of excluding products for which the information may not seem to be quite complete, rather than to accept a product for the first list and take it off from a later one.

The absence of a chemical specialty from the list, however, should not mean at all that the product lacks merit, but merely, that the information concerning it was too indefinite or incomplete for inclusion with the others. Very probably many meritorious products, widely known and sold, will never "make" the list because they are very properly secret preparations. On the other hand, if a product were to be included too hastily in the first list, it would be embarrassing to explain why it should be removed from a later one. In view of these facts we recommend that unless the manufacturer or agent is prepared to give all the information required for a given product, that that product rather be left off the list from the beginning.

In the preparation of the list of dyes which has run through several editions of the Year Book, only those dyes have been included which are made in America. The policy with respect to the list of chemical specialties will be broader, that is, both American-made and imported products will be catalogued, along with the name of the actual manufacturer or the importer, as the case may be. On the other hand, in order to keep the list within hand and not to include information which is equally well available from other sources, the so-called heavy, or common chemicals such as salt, and caustic soda will not be included.

We earnestly solicit your cooperation in this new activity of our Society for the preparation of a correct and authentic list of chemical specialties available in America for the processing of textile materials because we feel that the list will aid the manufacturer or importer to bring new and useful products to the attention of the mill chemist. The information we request may be tabulated as follows:

1. Commercial name of chemical specialty.
2. Principal uses, very briefly.

3a. Synthetic chemical name or chemical formula, if an essentially pure substance; or
b. complete qualitative composition, if a mixture; or
c. method of manufacture very briefly, with names of raw materials.

Please send us the above data as soon as possible or at least within the next four weeks. Your assistance in this matter will be very greatly appreciated.

Very truly yours,

COMMITTEE
CARL Z. DRAVES, *Chairman*
W. S. WILLIAMS

President Rose: That completes our reports of committees and I will call upon anybody who has any new business to bring before the meeting to do so.

If there is no further business, a motion to adjourn is in order.

. . . Upon motion duly made and seconded, the meeting then adjourned at ten twenty-five o'clock . . .

MEETING OF LOWELL TEXTILE INSTITUTE STUDENT SECTION

A MEETING of the Student Section of the A.A.T.C.C. was held at the Lowell Textile Institute on Dec. 6, 1933.

Henry D. Grimes, chief chemist at the wood mill of the American Woolen Co. in Lawrence, Mass., gave an interesting talk on "Color Blindness."

Respectfully submitted,

CHARLES L. DALY,
Secretary.

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Irving J. Royce, Salesman, Royce Chemical Co., Carlton Hill, N. J.

Pearce H. Baker, Lubrication Engineer, The Texas Co., Spartanburg, S. C.

FALL MEETING, SOUTH CENTRAL SECTION

THE Fall Meeting of the South Central Section was held at the University of Chattanooga in Chattanooga, Tennessee, on the evening of Friday, November 24, 1933.

The chemists of Chattanooga were invited to meet with the South Central Section on this occasion, to consider plans for a Chemists' Club in Chattanooga. It was definitely decided to form such a club and the first meeting was set for December 15th. The Section feels that under its chairman, Harold Schroeder, it has been of worthwhile service in sponsoring the above group.

Andrew Kelly of the Burkart Schier Chemical Company spoke on the subject of "Penetrants."

Respectfully submitted,

ANDREW KELLY,
Secretary.

RAYON SUB-COMMITTEE MEETING

THE eighth meeting of the Rayon Sub-Committee was held at the University Club, Providence, R. I., on the evening of November 24th, 1933. The meeting began with an informal dinner at 6:30 P. M. and was adjourned at 11:30 P. M. Most of the members and guests present took an active part in the discussions of the five subjects considered by the Committee. B. L. Hathorne, Chairman of the Committee, presided.

Rayon Symposium for 1934 Annual Meeting of the Society

The suggestion that the Sub-Committee might cooperate to prepare for the 1934 annual meeting of symposium on rayon covering the entire subject in a general manner from raw cellulose to finished rayon fabrics met with the hearty approval of the entire Committee. Several members volunteered to deliver lectures if called upon. All members were especially anxious that troubles noted in finished fabrics should be thoroughly discussed from all pertinent angles by Committee members thoroughly familiar with their subjects. Others pointed out that the symposium should be presented as a unit—each paper supplementing the others and each being part of a general program. It was felt that the story of rayon could be intelligently presented only in this manner. The suggestion was made that an outline of the entire group of papers should be prepared and passed upon by the Committee soon in order that the individual papers might be prepared in time to be considered by the Committee before presentation at the annual meeting.

The plans assumed definite shape so fast that the Chairman found it necessary to warn the Committee that the Committee should wait acceptance of its offer to present a symposium by the Research Committee before going ahead too far with specific plans.

Discussion of Choice of Dyestuffs Suitable for Determining the Fastness of Dyestuffs on Dyed Acetate

Mr. Church, who has devoted a very considerable amount of time to this subject, presented a group of dyeings clearly showing that the more drastic of the wash tests used for determining the fastness of dyestuffs on dyed silk are entirely too drastic for acetate. He pointed out that the nature of acetate is such that its special dyestuffs cannot be expected to be fast to washing at temperatures exceeding 180 degrees Fahrenheit.

The Committee unanimously agreed that there is not, at this time, in existence sufficient data to enable a choice of dyestuffs capable of serving as standards to be made. The Committee voted to request the Research Committee to allot a research fellow to this problem.

Discussion of "Short Cut" Tests for Determining Certain Properties and Causes of Faults Observed in Rayon Yarns and Fabrics

For the second time, the Committee discussed, enlarged, and changed a group of "short cut" tests used by various members of the Committee and compiled for the purpose of publishing for the benefit of the Association after being made as fool-proof as possible, and after a careful check by various members of the Committee.

Many corrections and changes were made at the meeting which necessitates the rewriting of the tests for the further consideration of the Committee.

Discussion of "Rayon Identification"

It was pointed out that the publication, "Rayon Identification," published by the Committee in 1931, has become obsolete in two respects—identification of pigmented rayon and identification of cuprammonium rayon. Suggestions were made with respect to necessary changes which will be made by the Committee after which "Rayon Identification" will be brought up to date.

Discussions of Means of Measuring Variations in the Creping Power of Filling Yarn

A method of measuring variations in the creping power of yarns taken from boiled-off and finished fabrics was presented to the meeting with the thought that it would initiate discussion upon the current problem of properly placing the blame for variations in appearance of finished crepe fabrics.

This problem will be discussed in greater detail at future meetings.

Discussion of Means of Predetermining the Wash Fastness of Dyestuffs When Dyed on Acetate

Mr. Simon and Mr. Jones were kind enough to show the meeting a series of dyeings proving that insofar as these particular dyestuffs are concerned, it is possible to force acetate to absorb more dyestuff than it can retain throughout normal household washing and that the ability of acetate to retain specific dyestuffs is not, in any way, changed by the presence of other dyestuffs in addition to the specific color tested.

At the conclusion of the meeting, the members expressed a desire to hold the next meeting of the Committee at an early date.

CALENDAR OF COMING EVENTS

Meeting, Midwest Section, Bismarck Hotel, Chicago, Illinois, Saturday, Jan. 20th. Dinner at 6:30 P. M.

* * *

Meeting, Rhode Island Section, combined with meeting of the R. I. Section of the American Steel Treaters Ass'n, February 7th. Robert Williams of M.I.T. will speak on "Corrosion."

* * *

Meeting, New York Section, Paterson, N. J., January 26th.

AMERICAN
DYESTUFF
REPORTER

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Published biweekly by
HOWES PUBLISHING CO., INC.
440 Fourth Avenue, New York City

A. P. HOWES
President

M. D. REESER
Secretary

H. F. CRAWFORD
Treasurer

Subscription price: $5.00 per year; Canadian $6.80; foreign $6.00

Vol. XXIII January 15, 1934 No. 2

DYE IMPORTS IN 1933

ACCORDING to an announcement made public last week by C. C. Concannon, Chief of the Chemical Division of the Bureau of Foreign and Domestic Commerce, dye imports were considerably higher during 1933 than they were in the preceding year. The figures substantiating this fact are as follows:—In 1933 the dye imports, entered for consumption, amounted to 4,288,214 pounds and were valued at $4,791,704. On the other hand the amount of dye imports entered in 1932 amounted to 3,904,628 pounds and were rated at a value of $3,516,968. Figured on a percentage basis the invoice value of dyes imported in 1933 represented an increase of 36% as compared to 1932. On the same basis the amount imported in 1933 figured on a poundage basis represented an increase of slightly less than 10% over 1932.

This indicates that besides the increase in poundage and invoice value there was also a trend toward the purchase of higher priced products for importation. The unit value per pound for 1933 was $1.11 a pound which represented an increase over the 1932 value of 20c per pound. It must must be remembered, however, that this increased value may be accounted for by the changing currency values here and abroad.

In regard to the amount of imported dyes consumed in comparison to those of domestic manufacture it has been estimated that the imports account for one-fifth of the value of United States consumption. It is believed that when complete figures are available the 1933 average will be above that of recent years. The preliminary 1933 ratio was calculated by making a comparison of the approximate duty paid value of imported dyes entering into domestic consuming channels with the estimated value of total 1933 consumption. It is obvious that when actual figures and facts are available there will be some deviation from the figures quoted above.

If consumer activity may be taken as a guide there was also an increase in American production during 1933. If estimates are made using a domestic sales figure 25% above that of 1932 the ratio of imports (duty paid value) to apparent domestic consumption is 17.5%. It is estimated by the Tariff Commission that an allowance of 15% should be made on imports to take care of profit and overhead. Using this estimation imports then become equivalent to 20% of domestic dye sales consumption.

As is to be expected the greatest percentage of dye imports were made through the port of New York with very much smaller amounts being entered through other ports. The incoming shipments for 1933 were entered through the various ports as follows: New York—4,220,827 pounds valued at $4,738,422; Boston—60,386 pounds valued at $48,427; Albany—3,819 pounds valued at $1,718; Newark—1,968 pounds valued at $2,895 and Philadelphia—1,214 pounds valued at $243. It is evident that the most expensive imports were made at Newark, it being the only case where the average value was as much as $1.47 per pound.

Almost entirely were all the imports accounted for by shipments from Germany and Switzerland during 1933,—Germany supplying approximately three-fifths and Switzerland practically two-fifths. About 2% of all foreign dye shipments originated in England and insignificant quantities in France and the Netherlands. The share of Germany during 1933 dropped from the 1932 figure of 68.27% to 59.66% while at the same time Switzerland's share increased from 29.54% in 1932 to 38.23% in 1933. In this connection we have been informed that one reason for the drop in Germany's participation is due to the fact that manufacturing production formerly carried on in Germany has been transferred to this country so that dyes formerly manufactured there and then imported are now being made here. This fact also accounts for the corresponding increase in percentage of imports from Switzerland as manufacturing operations there were continued as previously. Had the transfer of German operations not been made it is reasonable to suppose that the total dye imports would have shown an even greater increase than they did although such a supposition is open to speculation as the consumption may have been transferred to domestic production.

The Chemical Washing and "Antiquing" of

Oriental Carpets and Rugs*

By C. O. CLARK, F.T.I.

THE subdued harmonious tones of the colors of genuinely antique Oriental carpets are a subject of constant admiration, yet no one would be more amazed at the praise lavished on them than the original dyers, who would not recognize them in their present state, for, in fact, they have been produced by the fading of the original brilliant colors. Much nonsense has been written about the lost art of the old Oriental dyers and how the dyes they used were much faster than modern "aniline" dyes—and in passing it may be remarked that the very use of the term "aniline dyes" is most often a sign of the user's total ignorance of either the history of dyeing or of modern dyeing methods—but the truth is that when these old rugs came from the looms they were probably as garish to Western eyes as are the modern rugs, though both as they came from the looms were to Eastern taste. This is not to say that Western taste is superior to Oriental taste, only that they differ, due mainly to different geographical and consequently climatic conditions. What is suitable under the sun-flooded skies of Persia is out of place under the grey skies of England, and vice versa. Thus it was only on the colors fading, e.g., a bright red gradually fading to brown, that these carpets met with favor in Western eyes. Actually the old Oriental dyes were not as fast as modern synthetic dyes, and the fact that modern Oriental carpets do not fade as quickly as the old carpets did, is perhaps one of the minor reasons that have led to a general use of the "antiquing" process, for it is only the Oriental carpet whose original glaring colors have been subdued or flattened by fading in the case of old carpets, or chemical degradation or saddening in the case of modern carpets, that are acceptable to the public in Europe and America. The silky luster and soft handle of genuine old Oriental rugs is likewise a matter of age, the fibers having been worn smooth and lustrous by the wear of years.

For hundreds of years old Oriental carpets and rugs have been highly prized in Europe, but for a long time the high cost of transport rendered them available only to the very rich. The improvement in communications and the lessening of the cost of transport during the last century led by degrees to the Western demand for antique Oriental rugs becoming greater than the supply but, as with antique furniture, the fakirs were soon at work. This faking started first in the East, where at one time it was a fairly common practice to expose carpets in the bazaar or street with the object of giving them an artificial appearance of age. Later it was found that soaking the carpets in seawater helped to subdue and fade the colors, while other methods used to secure the appearance of age were to rub the back and pile of the carpet with pumice stone, and to singe the previously dampened pile with a spirit flame in order to remove the loose fibers and to give the wool the luster and appearance of age. Finally, the use of chlorine water was resorted to since it both degrades the colors and lusters the wool.

Little by little such processes passed from being purely fraudulent to their present position as a universally recognized trade process. Of course, a good deal of faking still goes on but the present firms of chemical washers of Oriental carpets and rugs have arisen because of the large demand that exists for Oriental carpets and rugs having the luster and subdued colors of the genuine antiques. Since no wool of itself possesses the required luster, and since it is impossible to match the faded colors of the antique rugs with direct dyeings, some after-treating process has to be resorted to. A small proportion of the rugs are treated by the weavers, but the majority are treated by European or American firms specializing in the chemical washing or "antiquing" of these carpets. The English firms engaged in this trade are all in the London area.

The carpets are usually delivered to the chemical washer direct from the ship and the first process is to unpack the bales, give each carpet an identification mark, and give the instructions for the processing appropriate to each batch, or in the case of the more valuable carpets, for each individual carpet.

Fair quantities of carpet yarn are now exported from Europe to the East, or are spun and dyed in the East by European methods. Such yarns are very often saddened after dyeing to secure as "antique" and quiet an effect as possible. This is usually done by giving an after-treatment with sumac, followed in some cases by treatment with copperas. The dyed yarn is entered into a boiling bath of ¼-1½ oz. sumac extract or ½-3 oz. sumac leaves per 10 gals. water, worked in the boiling bath for 2 hours, taken out and dried without rinsing. Light and bright shades require less sumac than dark ones. If this does not sufficiently sadden the colors a further treatment with a cold dilute solution of copperas

* The Textile Manufacturer.

(ferrous sulfate) may be given, but care must be taken that this saddening is not overdone. The advantage of treating the yarns in this manner is that the carpets woven from them will only require to be lustered and need not be treated to a severe chemical process to degrade their colors.

The first stage in the "antiquing" of Oriental carpets is the complete removal of all dirt and dust. With some classes of carpets, e.g., cheap Indian carpets, the usual tumbling machine suffices or air may be blown or sucked through them. But with some carpets, e.g., Persian carpets and the like, which have had a long journey over the desert, resulting in them being full of the wind-blown desert dust, the only way of completely removing the dust and dirt is to use a beating machine. To wet a carpet containing this fine dust would be fatal for it would form immediately a mud, the removal of which, if at all possible, could only be done by treatment which would damage the carpet. Some of the dust in the carpets is due to the habit of Eastern hand-weavers of rubbing their fingers in fine dust or sand when making the knots.

Following the removal of dust, etc., the carpets are given a final cleanse by washing. Soap and soda used to be used for this purpose but these have been replaced of late by products now on the market. The carpets are treated in the washing machine for ¼-½ hr. in a cold solution of 1-2 lb. of these products per 100 gals. water. These products have the decided advantage for this class of work that they do not form sticky lime soaps in the carpet, and their use results in a more lustrous finish than is obtained where soap is used. In some cases the carpets are placed flat out on concrete floors and sprayed with a solution of the product and brushed, but this method is not advisable with many of the cheap modern Indian carpets whose loose pile would be damaged by brushing. The carpets are then thoroughly rinsed and squeezed or centrifuged.

In most cases the next process consists of treating the rugs with a solution of bleaching powder. Here two things happen. In the first place the colors are toned down; the changes of shade produced, varying with the particular dyestuff concerned, may be very far-reaching, in some cases complete destruction of the color taking place. In the second place the chlorine attacks the wool fibers, loosening the surface scales which are removed by subsequent washing and brushing, leaving the fibers smooth and lustrous. This treatment is, of course, detrimental to the strength of the fibers and results in carpets of inferior wearing properties, but it is considered that this is more than offset by the vast improvement obtained in color, luster and texture. Great care has to be taken that the process is not allowed to go too far and the pile irretrievably damaged. Bleaching powder solutions of 1/8½° Tw. are used, in some cases the rugs being immersed in it, but the best method is to spread the wet carpet on the floor, sprinkle with the bleach solution, and brush vigorously in the direction the pile lies. After 5 or 10 mins. the light shades have been degraded so far that they look like the same shades would after long exposure. The carpets are then rinsed by spraying with cold water until the smell of chlorine disappears, at the same time giving a vigorous brushing along the set of the pile. They are then acidified in a solution containing 3% acetic acid on the weight of the goods, brushed once more, and centrifuged or squeezed. In some cases chlorination is preceded by treating for a quarter to half-hour at 30°-40° C. with 1 lb. caustic soda or trisodium phosphate in 50-80 gals. of water, followed by a thorough rinse with cold water.

In some cases where luster is desired rather than degradation of the colors, the carpet is treated with 80° Tw. caustic soda which attacks wool only very slowly in the cold. When this solution is rinsed off, the dilute caustic soda so formed attacks the fibers, removing the scales, and so giving a luster.

A caustic soda treatment is also used by fakirs of antique Oriental carpets. They paint the ends and sides of the carpet with dilute caustic soda; this removes some of the pile at these points and thus gives an impression of wear and age, for it is at the ends and sides that rugs first begin to show signs of wear in actual use.

Mothproofing comes next, the carpets being treated in a liquor not longer than 30/1 containing 3% of a mothproofing product on the weight of the carpets. They are worked in the washing machine with the cold solution for ¾ hr., taken out without rinsing, centrifuged or squeezed, and dried. Drying takes place usually under tension so as to set the carpet to lie flat.

In certain cases the carpets may be mothproofed by spraying them with the mothproofing solution. They are spread on the floor face down, and a solution of 1-1¼ oz. mothproofing product per gallon of water poured evenly over the back. After several minutes the carpet is turned over and the pile uniformly wetted with the mothproofing solution, thorough saturation being obtained by brushing the carpet in the direction the pile lies. This method is only suitable for carpets that have not been chlorinated. Chlorinated carpets are mothproofed only by immersing them in mothproofing liquor since they lose luster if it is sprinkled on to them.

The next process is the shearing of the carpets. This is done by machinery though the ends and sides have to be treated by hand. The carpets are then examined and mended. Cuts are sewn together by a process akin to weaving, holes have new wraps and knots inserted, badly stained or off-color patches have their knots picked out and replaced by new ones, etc. Of late years, the use of aerograph pistols for patching up colors or altering the whole of a color in the pattern has come into favor. Their use has obviated a good deal of mending that used to have to be done in the replacing of patches that were off shade.

The final finish of the carpets used to be obtained by hot pressing, hot ironing, or hot calendering, after a previous dampening. Nowadays, however, the application

(Continued on page 56)

Atmospheric Exposure of Linen and Cotton

with Special Reference to Fish Nets*

By W. T. CONN
U. S. Bureau of Fisheries, Washington, D. C.

Introduction

THE desire for preservation of fish nets dates back almost as far as the use of cellulose fiber thread in the construction of such nets. When the investment in gear of this type and the high rate of depreciation are considered, one wonders at the lag in systematic study that might lead to increased service life of nets.

Nets have been preserved to a considerable extent by highly individualistic rule of thumb methods, although certain principles have been established within limited world areas. Tanning or cutching has long been an established preservative principle and is extensively used in many parts of the world. In northwestern Europe this preservative is used almost exclusively and is well adapted to the types of fishing practiced. Details of tanning have been extensively investigated by Norwegian scientists and more recently by Germans. Limited investigation of net preservation has been carried on in Great Britain and in the past few years considerable study has been given to the subject by the Bureau of Fisheries, especially with reference to the problems which are peculiarly American.

It is obvious that fish nets are either in the water or in the air and may be subject to deterioration in either medium. Investigations in general have dealt primarily with deterioration due to water exposure, but this paper deals exclusively with limited phases of atmospheric exposure.

Fish Nets and Their Depreciation

For the purpose of this paper, the gear used by American fishermen may be classed as "heavy" or "light." The former is generally knit from heavy cotton and is commonly subjected to long periods of water exposure. It represents roughly a normal investment in continental United States of $13,350,000. The average service life is estimated at 18 months and tar in some form is the most common preservative used. "Light" gear is of relatively higher quality and finer thread and generally is exposed to the water for a minimum of time during the fishing season. In continental United States, the normal investment in gear of this general class is over $3,000,000; much of it is used without preservatives, although tanning or copper oleate treatments are not uncommon.

Depreciation during water exposure is due to somewhat the same forces that wear out nets in the air, but the several destructive agencies have relatively different intensities in the two media. In water exposures, as many as twelve different destructive forces have been noted, although not all have been found in the same locality and some occur rarely. Perhaps the most general and destructive element attacking submerged nets is a cellulose digesting bacillus existing in different forms in salt and fresh waters. Other bacteria existing in the slime that fouls every fish net may cause heating in a wet heaped net exposed to the air. Mechanical forces often very destructive to submerged nets, should be a minor factor in damaging nets out of the water unless handling is grossly careless. Oxidation has been proven destructive to nets in the water especially where weed growth is attached and in cold water. Its influence on nets out of the water is possibly negligible, except indirectly through preservatives. The action of the ultra-violet ray as contained in sunshine doubtless causes some loss to staked nets in use, some parts of which are above the water line. This destructive force acting on nets in the air has been recognized but hitherto has been given minor consideration. The purpose of the tests described in this paper is to demonstrate in a limited way the seriousness of exposing nets to direct sunshine.

Previous Observations

It has been noted that the general practice of gill net fishermen in southeastern United States is to dry and temporarily store nets on racks subjected to sun exposure. However, one fisherman in Florida had his racks under a palmetto leaf shelter and was reported to get double the service from his nets when comparison was made with neighbors fishing similarly, but drying and storing their nets in the sun. A preliminary test was made in the summer of 1932, in which linen and cotton threads were exposed to sun and rain. The depreciation within a few weeks was so serious that tests in some detail were advisable.

Preparation and Exposure of Material

40/3 linen and 36/6 Sea Island cotton were selected for test as representative twines in use upon the Atlantic Coast. As the possible influence of industrial contamination of the atmosphere and consequent interference with tests was recognized, an effort was made to secure test locations where sun hour records were available and where there was the least probability of contaminated air.

* Publication of Bureau of Fisheries.

Through the cooperation of the United States Weather Bureau, Department of Agriculture, arrangements were made for exposure of samples by Weather Bureau officials at Key West, Florida, (Cape) Hatteras, North Carolina, Atlantic City, New Jersey, and Eastport, Maine. Personal attention was given to twines exposed at the Bureau of Standards, Washington, D. C.

Twine samples for exposure were wound, with spaces between threads, over ⅝ inch dowels with 20 inch separation. This allows tensile strength test pieces to be cut at the dowels. For exposure to rain and sun, the dowels were held on projecting arms with the threads vertical and kept taut by two pound brass springs. The supporting arms were constructed so that no shadows fell upon the test threads when the latter were faced to the south. For exposure to rain alone, samples were similarly prepared on racks that were placed in a well ventilated wooden case from which direct sunshine was excluded, but through which rain passed over the twines from a concaved perforated top.

The samples were exposed four feet above the roofs of the several stations, the sun samples in all cases facing south. Exposure was made about April 1, test samples being removed from the Weather Bureau stations at intervals of two months and from the Washington, D. C., tests at about the end of each month. At the latter point fresh samples were exposed about the first of each month so as to secure the effect of weathering fresh twine during each month. The theft of stock shortened the July tests.

Twines were tested for tensile strength in a standard machine with eight inches between centers of terminal spools after samples had been conditioned at 70° F. and 65% humidity. Breaks at splices were disregarded. Ten twines were taken for each test. Unexposed 40/3 linen thread tested 9.91 pounds and 36/6 Sea Island cotton tested 5.49 pounds.

Records of exposure appear in the following tables. Tensile strength is expressed in pounds.

Table 1

Exposure of 40/3 Linen and 36/6 Cotton Threads at Weather Bureau Stations, Key West, Florida, Lat. 24° 28[1] N., Started March 31, 1933.

Duration of Exposure		*Linen*				*Cotton*			
		Tensile strength		*Pounds depreciation per sun hour*		*Tensile strength*		*Pounds depreciation per sun hour*	
	Sun	*Dried in*		*Dried in*		*Dried in*		*Dried in*	
Days	*Hours*	*Sun*	*Shade*	*Sun*	*Shade*	*Sun*	*Shade*	*Sun*	*Shade*
63	555	5.10	9.98	.0087	[1]	3.68	5.73	.0033	[1]
124	1045.9	2.50	8.48	.0071	.0014	2.20	5.65	.0031	[1]
186	1575.9	1.10	9.70	.0056	.00013	1.15	5.60	.0028	[1]
(Cape) Hatteras, North Carolina[2], Lat. 35° 13′ N., Started April 4, 1933.									
59	516.7	6.85	11.18	.0059	[1]	4.02	6.10	.0029	[1]
120	1056.2	3.78	9.93	.0058	[1]	2.35	5.93	.0030	[1]
180	1579.4	1.63	9.63	.0052	.00018	1.15	5.65	.0027	[1]
Atlantic City, New Jersey[3], Lat. 39° 22′ N., Started March 31, 1933.									
63	513.9	6.93	10.80	.0058	[1]	3.90	5.98	.0031	[1]
124	1091.9	2.90	6.05	.0064	.0035	1.40	4.65	.0037	.00077
184	1542.7	1.45	4.65	.0055	.0034	1.00	3.58	.0029	.0012
Eastport, Maine[4], Lat. 44° 53′ N., Started March 31, 1933.									
62	445.2	7.73	10.85	.0049	[1]	4.58	5.85	.0020	[1]
125	971.0	5.15	10.45	.0049	[1]	2.98	5.93	.0026	[1]
185	1314.7	4.00	9.50	.0045	.00031	2.28	5.75	.0024	[1]

[1]Twines were stronger than before exposure.
[2]Sun hours after September 13 estimated, due to wrecking of instruments by storm.
[3]Investigation disclosed that samples were subjected at times to soft coal smoke containing sulfurous acid.
[4]Twines were darkened as though exposed to smoke.

Table 2

Six months' Exposure of 90/3 Linen and 36/6 Cotton at Washington, D. C.: Lat. 38° 52′ N., Started March 31, 1933.

Duration of Exposure		*Linen*				*Cotton*			
		Tensile strength		*Pounds depreciation per sun hour*		*Tensile strength*		*Pounds depreciation per sun hour*	
	Sun	*Dried in*		*Dried in*		*Dried in*		*Dried in*	
Days	*Hours*	*Sun*	*Shade*	*Sun*	*Shade*	*Sun*	*Shade*	*Sun*	*Shade*
35	293.1	8.65	10.95	.0043	[1]	4.88	6.03	.0021	[1]
63	489.3	6.53	11.20	.0069	[1]	3.65	5.75	.0038	[1]
95	820.8	4.30	9.50	.0068	.0005	2.38	5.38	.0038	.00013
124	1100.9	3.50	8.38	.0058	.0014	1.80	5.08	.0034	.0004
154	1334.4	2.85	7.45	.0053	.0018	1.30	4.53	.0031	.0007
186	1552.6	2.50	9.30	.0048	.0004	1.20	4.28	.0028	.0008

[1]Twines were stronger than before exposure.

Table 3

Monthly Exposure of 40/3 Linen and 36/6 Cotton at Washington, D. C.
Lat. 38° 52' No.

Duration of Exposure	Sun Hours	Linen				Cotton			
		Tensile strength Dried in		Pounds depreciation per sun hour Dried in		Tensile strength Dried in		Pounds depreciation per sun hour Dried in	
		Sun	Shade	Sun	Shade	Sun	Shade	Sun	Shade
3/31/33 to 5/4/33	293.1	8.65	10.95	.0043	[1]	4.88	6.03	.0021	[1]
5/5/53 to 6/1/33	196.2	8.60	10.78	.0067	[1]	4.98	6.13	.0026	[1]
6/2/33 to 7/3/33	331.5	7.50	10.20	.0073	[1]	4.18	6.08	.0040	[1]
7/11/33 to 8/1/33	186.7	7.95	10.13	.0105	[1]	4.60	5.18	.0048	.0017
8/2/33 to 9/1/33	233.5	7.33	10.40	.0110	[1]	4.35	5.73	.0049	[1]
9/2/33 to 10/2/33	218.2	8.68	9.90	.0056	slight	4.48	5.68	.0046	[1]

[1]Twines were stronger than before exposure.

General Comments

One feature in all of these tests is the unexpected increase in strength of twines subjected to rain but protected from direct rays of the sun. As a means of securing some explanation of this characteristic, stock twines were wound on one of the shade exposure frames, immersed in distilled water for 24 hours and conditioned for test. The 40/3 linen tested 10.18 pounds and the 36/6 cotton, 5.75 pounds. When wet, the twines contracted against the spring tension but on drying appeared to be of original length. No positive reason can be assigned at this time for the increase in tensile strength evident in these tests.

Examination of the exposure record at Key West, Fla., shows that the linen, exposed to sun and rain as light nets are now generally exposed for drying (and sometimes storage), loses nearly half its tensile strength in two months. From the Washington, D. C., tests, one may judge that this destruction is well below that which would be produced if new twine had been exposed during July and August. While the linen exposed to rain but dried in the sun lost nearly half its strength, twine from the same spool subjected to rain but dried in shade, actually gained in strength. This shade-dried twine represents the effect that might be expected upon nets dried in shade.

Depreciation in strength of cotton subjected to rain and sun during April and May is less pronounced but is serious, amounting to about 33 per cent. Cotton from the same spool subject to rain only, maintained a strength above that of new stock during the entire six months' test period. In the period from June to September, inclusive, the sun-exposed linen and cotton continue losses in strength. The shade-dried linen in this period weakens to a limited amount. However, if the same depreciation occurred in a gill net, it would be commercially negligible.

It may be assumed that a gill net is of no value when the webbing has depreciated 50 per cent in strength. Upon this basis, 40/3 linen subjected to sun and rain at Key West, Fla., is useless after 7½ weeks' exposure and 36/6 cotton is useless after 17½ weeks' exposure. Both the linen and cotton subjected to rain but dried in the shade indicated a commercial life well beyond the 26 weeks' test period.

The Hatteras tests correspond closely to those at Key West when consideration is given to the higher latitude. With the total sun hours almost identical, depreciation of both the linen and cotton when subjected to rain and sun is rapid and constant. The shade-dried linen is stronger after 4 months than when new and after 6 months it has lost little. The shade-dried cotton maintains a strength greater than when new during the entire period. The sun-dried linen depreciated 50 per cent in strength in 13 weeks. The cotton showed the same depreciation in 18 weeks.

The tests at Atlantic City are of limited value as investigation disclosed that the twines were subjected at times to fumes from two soft-coal fires and twice during July, sulfur dioxide gas was very noticeable at the station. It will be recognized that this gas in moist air would be very destructive to any vegetable fiber. The sun exposed twines deteriorate faster than at Hatteras. Although exposed to sulfurous acid fumes, the shade-dried twines depreciated much less than those dried in the sun.

The Eastport samples indicated that they were subjected to smoke; but, apparently, this had little chemical effect. Higher latitude and fewer sun hours result in lessened destruction to sun-dried thread. The linen depreciated 50 per cent in 19 weeks. The cotton maintained over half of its original strength in the 26 weeks' test. The shade-dried linen maintained high tensile strength until the period when local factories became active.

In the Washington tests it is apparent that there was some depreciation caused by agencies other than atmospheric. These influences, however, appear somewhat constant and apparently do not seriously interfere with the acceleration in the rate of sun hour depreciation which reaches a maximum in August for both linen and cotton.

Based upon the limited data available, it is apparent as might be anticipated that sun-hour damage decreases as latitude increases.

The sun-hour depreciation of linen and cotton is materially increased during mid-summer.

It is apparent from the performance of both the linen and the cotton that maximum sun-hour depreciation lags several weeks behind the summer solstice and that this maximum damage is most pronounced upon linen. It is

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B. R. ARMOUR HONORED

Employes and Associates Tender Executive Dinner on Twenty-fifth Business Anniversary

BERNARD R. ARMOUR, president of American Aniline Products, Inc., and the dominant figure in many other industrial enterprises, was tendered an elaborate dinner at the Waldorf-Astoria Hotel, New York City, by some seventy-five of his business associates and key employes on the evening of Thursday, January 11, 1933, the occasion marking the twenty-fifth anniversary of his entrance into the chemical business.

B. R. ARMOUR

At the conclusion of a truly Lucullan repast, Mr. Armour's personal attorney, George F. Lewis, of the firm of Tibbetts, Lewis & Rand, presented to Mr. Armour, on behalf of those present, a beautiful platinum watch bearing an inscription testifying to the admiration and devotion of the donors.

In his speech of presentation Mr. Lewis outlined Mr. Armour's career, beginning with his entrance into the chemical business under the corporate title of Swiss Colours Co. in 1909, the formation of American Aniline Products, Inc., in 1916, the acquisition of G. Siegel Corporation of America and, in 1922, of Heyden Chemical Co., and later of Ansbacher Color Corp. and Ansbacher Insecticide Co., which were merged with the Siegel Corp. to form the present Ansbacher-Siegel Corporation. All of these concerns, said Mr. Lewis, had been acquired when on the verge of bankruptcy and, by the exercise of a native genius for reorganization and the expenditure of limitless energy, converted by Mr. Armour into sound and profitable institutions.

The acquisition of control of Associated Dyeing & Printing Co. at a time when its affairs seemed hopeless, and the tireless struggle for its rehabilitation which has since been ceaselessly waged, constitute the latest chapter in Mr. Armour's industrial saga and one which, Mr. Lewis believed, would be brought to as successful a conclusion as the earlier ventures.

In acknowledging the speech of presentation, Mr. Armour voiced his deep appreciation of the loyalty and devotion expressed in the gift. Speaking with obvious emotion he thanked those who had stood with him through many trying times and said that the reward of effort which he esteemed above money or power was the respect and affection of his associates.

At the conclusion of his remarks, verbal tribute was paid to Mr. Armour by executives of the various companies previously mentioned as well as by representatives of the Bank of Manhattan Co. and the Celanese Corporation of America, which is associated with American Aniline Products in the manufacture of SRA dyes.

Reorganizes Executive Staff

A general reorganization of the executive department of the National Oil Products Company, Harrison, New Jersey, has been announced by C. P. Gulick, president of the company. These changes were effective as of January 1st.

Vice-president J. H. Barton has been relieved of his duties as head of the farm feed department and has been made general manager of the company. He has been placed in charge of production and the physical properties of the company, including plants, warehouses and real estate.

Secretary G. D. Davis has been appointed general sales manager in charge of the sales of the industrial, farm feed and Admiracion departments.

Treasurer Ralph Wechsler has been relieved of many commercial duties in order to permit him to concentrate on his work as technical director of the company. He retains the general supervision of the Vitex department.

Dr. C. I. Post remains as manager of the Vitex department in general charge of Vitex sales to the food industries.

E. T. Woods continues as works manager, being responsible to Vice-President Barton.

ATMOSPHERIC EXPOSURE OF COTTON AND LINEN

(Continued from page 54)

possible that the sudden decrease in depreciation of the linen following the maximum is misleading; the general detail might be modified by more extensive tests under improved atmospheric conditions.

Conclusions

The following principles may be drawn from the foregoing tests:

1. Linen and cotton subjected to rain and sunshine depreciate in tensile strength much more rapidly than the same stock subjected to similar conditions except that direct sun rays are excluded.

2. Tensile strength depreciation of linen and cotton subjected to rain and sunshine decreases as latitude is increased.

3. The depreciation in tensile strength of linen and cotton subjected to rain and sunshine reaches a maximum a few weeks after the summer solstice.

4. Sunshine damages linen more seriously than cotton.

5. The service life of fish nets or other material of similar composition subjected to intermittent wetting, is materially conserved by drying out of contact with sunshine.

6. Industrial gases damage wet linen seriously while cotton is affected to a lesser extent.

ORIENTAL CARPETS AND RUGS

(Continued from page 51)

of various preparations designed to impart softness and luster to the wool is fairly general before calendering or pressing. A wide variety of such preparations have been used, e.g., one used some years ago in Germany consisted of Turkey red oil, sugar and glycerine in aqueous solution, while other preparations that have been used are a solution of shellac in borax or ammonia; a solution of dextrine in glycerine, tartaric acid along with glue or ox gall, decoctions of Panama wood and glue, and the like. These mixtures undoubtedly enhance the luster, but the effect produced is different from that produced by age or the skillful chlorination of naturally lustrous wool. In addition, most of these compositions give an effect which quickly wears off. Oil emulsions have been tried but unless a drying oil is used they are not permanent. Wax emulsions give a good luster at first, but in common with oil emulsions they have the drawback that carpets to which they have been applied soon collect dirt and dust and assume a bedraggled appearance.

Genuinely old Oriental carpets and rugs are distinguished from the chemical-washed rugs fairly easily. If the colors look as though they have faded unequally. i.e., each individual color is the same throughout yet one color has faded more than another, it may be assumed with safety that the carpet is half a century old at the least. Carpets containing white effects, which are pure in color and rather harsh, are certain to have never been subject to a chemical wash. If the carpet is in good condition and shows no signs of wear, but has mellow colors which are a little indefinite, it is most probable that it has been through a chemical washing process. The presence of whites shaded with a yellowish-grey, or signs of one color bleeding or merging into another, are definite indications that the carpet has been chemically washed.

Appointed Representative

G. K. Heller, 217 N. Calvert St., Baltimore, Md., has been appointed sales representative for the Glyco Products Company, Bush Terminal Bldg. No. 5, Brooklyn, N. Y.

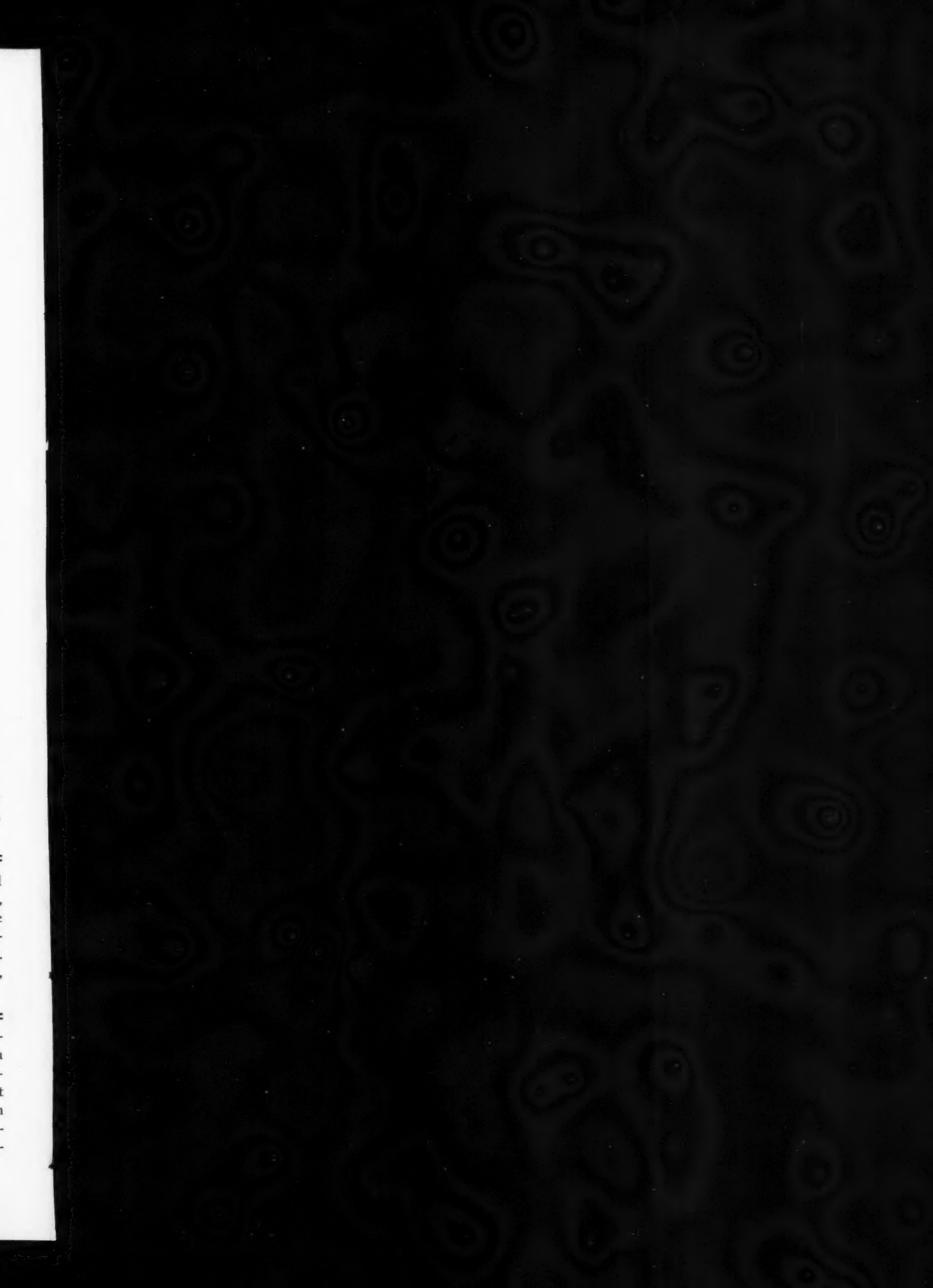
He will service the newer synthetic resins, waxes and emulsifying agents in the Baltimore district. Mr. Heller's experience with emulsions will enable him to give the trade the benefit of his work and knowledge.

CLASSIFIED

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

FOR SALE

Two wooden Vat Machines for neutralizing and finishing mercerized yarns, equipped with copper steam pipe, monel metal propeller and shaft. Each tub to be complete with yarn racks having monel bolts and fittings, and each machine to have two sets of sticks. Machines of 125 lb. capacity each handling 54" skeins of yarn sized from 24 to 70 single and 2 ply, the batches from mercerizer to weigh 42 lbs. each, three batches to be accumulated to go through the neutralizing and finishing baths. Write Box No. 798, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED—Young dyestuff and chemical salesman with broad acquaintanceship in all territories, as well as six years in the Orient, plus practical textile manufacturing and dyeing experience, is available for employment with reputable manufacturer. Write Box No. 799, American Dyestuff Reporter, 440 Fourth Avenue, New York, N. Y.

POSITION WANTED—Plant chemist and rayon processing man with over ten years' practcial experience with leading American and European dyeing and printing organizations (pure weighted silk, rayon, Celanese) has just returned from Europe where he was in charge of rayon processing plant exporting rayon crepes to England, desires position. Write Box 800, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.